MODERN MECHANIX AND INVENTIONS

SEPT.

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SEE PAGE 48

Saunders

JUMPING JACK ARTILLERY TOWER

And Torpedoes That Chase Battleships – for Next War

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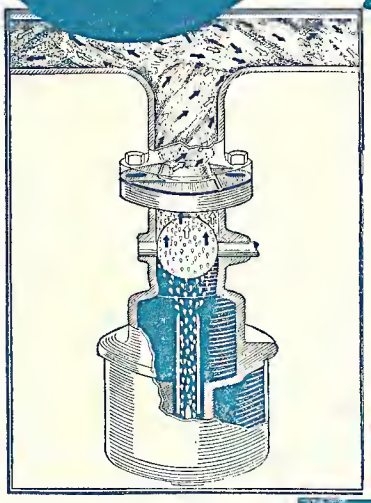
MODERN MECHANICS and INVENTIONS

SEPT. 1933

51 MILES ON A GALLON of GASOLINE WINS ECONOMY CONTEST

49 MILES Takes 2nd Place



Winning Cars Equipped With WHIRLWIND GAS SAVERS

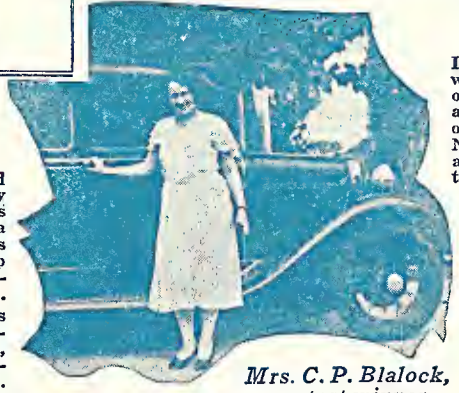
Automobile owners who have been worrying about gasoline expense will be interested in an amazing test recently conducted by a Texas Motor Car Company. Twenty-three cars were entered in a mileage economy test, the winning car running 51 miles on a gallon of gas, the second car 49 miles on a gallon. When official test records were published it was found the two winning cars were both equipped with Whirlwind gas savers.

"Peak" Contest Mileages

The amazing results obtained in this mileage contest are naturally greater than those obtained in ordinary driving. Careful throttling, most economical speeds—no traffic hold-ups—and no waste of power thru quick stops, help to bring about these "peak" mileages.

A Test On Your Car

More power, faster pick-up, less carbon, quicker starting, and increased mileage is what users say in telling of their experience with the Whirlwind. Every motorist owes it to himself to test the Whirlwind to prove the results on his own car.



Mrs. C. P. Blalock, contest winner

How Whirlwinds Save Gasoline

The principle of the Whirlwind is to slightly compress the partly vaporized gasoline as it passes thru the raised venturi. Extra air enters from four air inlets at such a tangent as to pick up the unvaporized gasoline particles, whirling them into action.

The turbulence created breaks them into a vaporized gas, giving better, smoother power, quicker starting, cutting gasoline waste and carbon formation.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you save.

GUARANTEE

No matter what kind of a car you have or how big a gas eater it is the Whirlwind will save you money. While we do not claim to produce 49 to 51 miles on ordinary driving, we do guarantee that the Whirlwind will save its cost within 30 days or the trial will cost you nothing. We invite you to test it at our risk. You are to be the sole judge.

Car owners all over the world are amazed at the results of their tests. "I have more speed, power, and increased mileage," writes Henry Bomberger. "Hills I used to take in second I now make in high." Anton Wetsch: "I wouldn't take the Whirlwind off my car for any money. I am certainly convinced." W. B. Fountain: "My mileage has increased greatly. My car has plenty of pick-up and starts like a whip."

SALESMEN AND DISTRIBUTORS WANTED
To Make Up To $100 A Week and More

Whirlwind men are making big profits taking care of local business for this fast selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MFG. COMPANY

Dept. 972-A Station C Milwaukee, Wis.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.,
Dept. 972-A, Station C, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

NAME .....

ADDRESS .....

CITY ..... *STATE* .....

☐ Check here if you are interested in full or part time salesman position.

BE A RADIO EXPERT

Many Make $40 $60 $75 a Week

J. E. Smith, President, National Radio Institute. The man who has directed the Home-Study training of more men for the Radio Industry than any other man in America.

I'll Train You at Home in Your Spare Time for RADIO · TELEVISION · TALKING MOVIES

Set Servicing

Spare time set servicing pays many N.R.I. men $5, $10, $15 a week extra. Full time men make as much as $40, $60, $75 a week.

Broadcasting Stations

Employ managers, engineers, operators, installation and maintenance men for jobs paying up to $5,000 a year.

Radio Factories

Employ testers, inspectors, foremen, engineers, servicemen, for jobs paying up to $7500 a year.

Aircraft Radio

Radio is making flying safer. Radio operators employed through Civil Service Commission earn $1,620 to $2,800 a year.

Talking Movies

An invention made possible by Radio. Employs many well-trained Radio men for jobs paying $75 to $200 a week.

Television

The coming field of many great opportunities is covered by my course.

If you are dissatisfied with your present job; if you are struggling along in a rut with little or no prospect of anything better than a skinny pay envelope—clip the coupon NOW. Get my big FREE book on the opportunities in Radio. Read how quickly you can learn at home in your spare time to be a Radio Expert—what good jobs my graduates have been getting—real jobs with real futures.

Many Radio Experts Make $40, $60, $75 a Week

In about ten years the Radio Industry has grown from a few million dollars to hundreds of millions annually. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you in the N.R.I. Course—have stepped into Radio at two and three times their former salaries.

Real Opportunities Ahead in Radio for Trained Men

It's hard to find a field with more opportunity awaiting the trained man. Why in 1932—the worst year of the depression—the Radio Industry sold $200,000,000 worth of sets and parts! Manufacturers alone employed nearly 100,000 people! About 300,000 people worked in the industry. In 1932, broadcasting had a most profitable year. It's a gigantic business, even in the worst business years! And look what's ahead! Millions of sets becoming obsolete annually. 17,000,000 sets in operation that need servicing from time to time! Over 600 great broadcasting stations furnishing entertainment and news to 100,000,000 people. These figures are so big that they are hard to grasp! Yet, they are all true! Here is a new industry that has grown quickly into a commercial giant. No wonder great business leaders predict a brilliant future for this great and growing business.

Get Into This Field With a Future

There's opportunity for you in Radio. Its future is certain. Television, short wave, police Radio, automobile Radio, midget sets, talking movies, public address systems, aircraft Radio—in every branch, developments and improvements are taking place. Here is a real future for thousands and thousands of men who really know Radio. Get the training that opens the road to responsibility, good pay, and success! Send the coupon now and get full particulars on how easy and interesting I make learning at home. Read the letters from graduates who are today earning good money in this fascinating industry.

Many Make $5, $10, $15 a Week Extra in Spare Time Almost at Once

My book also tells how many of my students made $5, $10, and $15 a week extra servicing sets in spare time, soon after they enrolled. I give you plans and ideas that have made good spare-time money—$200 to $1,000 a year—for hundreds of fellows. My Course is famous as "the one that pays for itself."

Money Back If Not Satisfied

I am so sure that N.R.I. can train you at home satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction Service upon completion. You'll get a copy of this Agreement with my book.

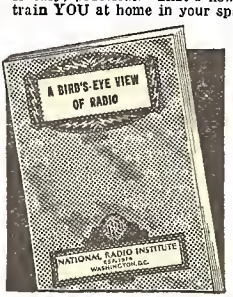
64-Page Book of Information Free

Get your copy today. It's free to any ambitious fellow over 15 years old. It tells you about Radio's spare-time and full-time job opportunities; it tells you all about my Course; what others who have taken it are doing and making. Find out what Radio offers YOU without the slightest obligation. MAIL THE COUPON NOW.

J. E. SMITH, President National Radio Institute, Dept. 3JH Washington D. C.

SAMPLE LESSON FREE

I'll send you a Free Lesson to prove that my Radio Course is easy, practical. That's how confident I am that I can train YOU at home in your spare time to become a Radio expert. Only my students could have this book in the past. I KNOW that when you see it, read it, examine it, you will be delighted with its clear, simple way of teaching Radio. I KNOW—because I have ALREADY trained thousands of men. Many of them with not even a grammar school education, and no Radio or electrical experience, have become Radio experts and earn two or three times their former pay. Mail the coupon now.



THIS COUPON IS GOOD for One FREE COPY OF MY BOOK — mail it now

J. E. SMITH, President
National Radio Institute, Dept. 3JH
Washington, D. C.

Dear Mr. Smith: Please send me your manual "A Bird's-Eye View of Radio" and your book "Rich Rewards in Radio," which points out the opportunities for spare time and full time jobs in Radio, and your method of training through home study. I understand this places me under no obligation.

Name.....*Age*.....

Address.....

City.....*State*.....

"R"

SEPT., 1933

VOLUME X
NUMBER 5

MODERN MECHANIX AND INVENTIONS

Donald G. Cooley
EDITOR

PRICE 15 CENTS
(20 CENTS IN CANADA)

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"I'll PROVE in Only 7 Days *that I Can Make* YOU a New Man!"

No other Physical Instructor in the World has ever DARED make such an Offer

Photo by Joel Feder.

By CHARLES ATLAS

Holder of the Title:
"The World's Most Perfectly Developed Man"
Won in open competition in the only national and international contests held during the past 15 years.

I HAVE proved to thousands that my system of building powerful, big-muscled men begins to show real results *in only 7 days*—and I can prove it to *you*.

You don't have to take my word for it. You don't have to take the word of my hundreds of pupils who have added inches to their chests, biceps, neck, thighs and calves in only a few days. No sir! You can prove for *yourself*—in just one week—by the change you see and *feel* in *your own body*—that you can actually become a husky, healthy NEW MAN—a real "Atlas Champion."

All I want to know is: Where do *you* want big, powerful muscles? How many pounds of firm flesh do *you* want distributed over your body to fill you out? Where do *you* lack vitality, pep, and robust health? Where do *you* want to take off flabby, surplus fat?

Just tell me, give me a week, and I'll show you that I can make a *New Man* of you, give you bodily power and drive, and put you in that magnificent physical condition which wins you the envy and respect of any man and the admiration of every woman.

My own system of *Dynamic-Tension* does it. That's the way I built myself from a 97-pound weakling to "The World's Most Perfectly Developed Man." And now *you* can have a big, balanced muscular development like mine in the same easy way.

No "Apparatus" Needed!

You begin to FEEL and SEE the difference in your physical condition at once, without using any tricky weights or pulleys, any pills, "rays," or unnatural dieting. My *Dynamic-Tension* is a *natural* method of developing you *inside and out*. It not only makes you an "Atlas Champion," but goes after such ailments as constipation, pimples, skin blotches, and any other conditions that keep you from really enjoying life and its good times—and it starts getting rid of them at once.

Let Me Tell You How

Gamble a stamp today by mailing the coupon for a free copy of my new illustrated book, *"Everlasting Health and Strength."* It tells you all about my special *Dynamic-Tension* method. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique, by my own secret methods. What my system did for me, and these hundreds of others, it can do for you too. Don't keep on being only 25 or 50 per cent of the man you *can* be! Find out what I can do for you.

Send for FREE BOOK

Where shall I send your copy of "Everlasting Health and Strength"? Jot your name and address down on the coupon, and mail it today. Your own new "Atlas body" is waiting for you. This book tells you how easy it is to get, my way. Send the coupon to me personally.

CHARLES ATLAS
Dept. 6-9
133 E. 23rd St.
New York City

Charles Atlas—As He Is Today

CHARLES ATLAS, Dept. 6-9,
133 East 23rd Street,
New York City

I want the proof that your system of *Dynamic-Tension* will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, *"Everlasting Health and Strength."*

Name .....
(Please print or write plainly)

Address .....

City ..... State .....

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EDITED BY EXPERTS

Listed here are the members of the Modern Mechanix Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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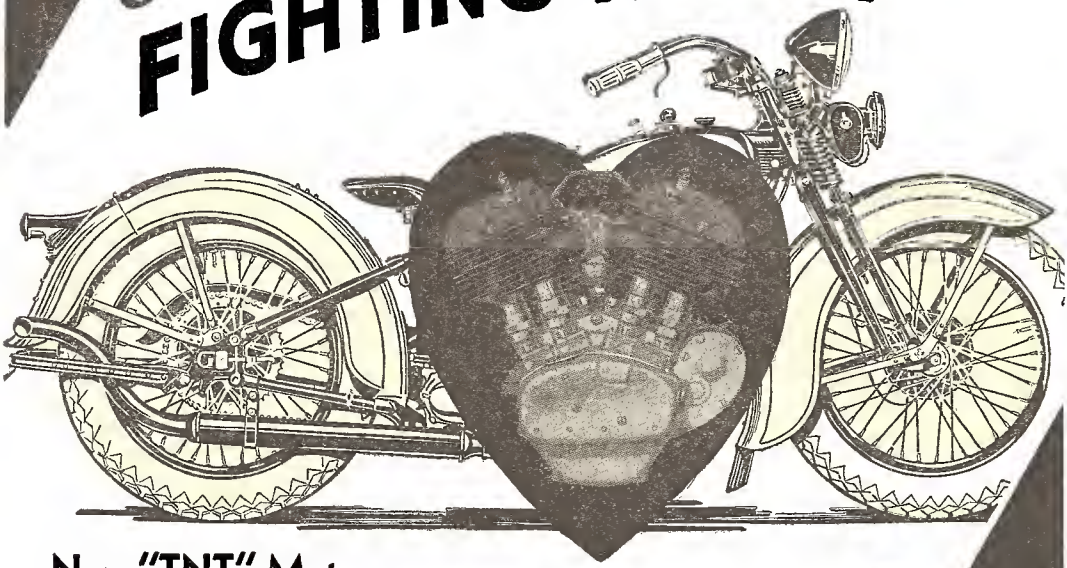
The Motorcycle with the FIGHTING HEART

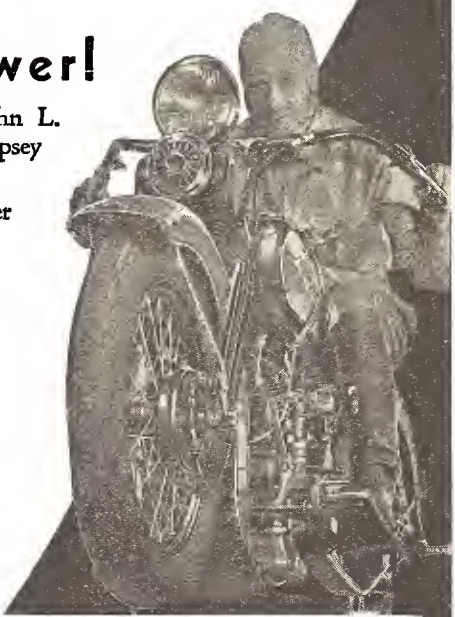


New "TNT" Motor—
Thirty-five Horsepower!

Jim Corbett had a "Fighting Heart." So had John L. Sullivan — and Bob Fitzsimmons. So has Jack Dempsey — and so has this new Harley-Davidson.

And what a "Fighting Heart"! Thirty-five Horsepower with a twin-cylinder, 74 cu. in. motor! That's efficiency! That's engineering! . . . . Just wait till you *feel* the power—the breath-taking getaway and speed of this "TNT" Motor, now standard in the "74 Twin" for 1934 without extra cost.

A demonstration will amaze you. See your nearby Harley-Davidson Dealer — look over the 1934 Twins and Singles—ask about his easy-pay plans.



HARLEY-DAVIDSON MOTORCYCLES

Mail this Coupon—find out how the new manifolding, oiling system, and other features make "TNT" the greatest motor we've ever built—a true "Fighting Heart".

HARLEY-DAVIDSON MOTOR COMPANY
Dept. M.M., Milwaukee, Wis.
Interested in the "Fighting Heart". Send illustrated literature—Postage Stamp is enclosed to cover cost of mailing.

Name _____

Address _____

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

A tiny sum invested today—and those precious lives that are in your keeping are made safe by old line, legal reserve life insurance. There is nothing complicated, nothing difficult. The Postal Life Insurance Company which has paid more than $40,000,000 to policy holders and has been known all over the world for 28 years, is now making a timely special offer which no one can afford to miss.

Just think of it. For a premium of only $1.00 per month you may have the protection of sound legal reserve life insurance backed by more than $21,000,000 in assets. Same premium for all ages—18 to 50 both men and women. The policy is written in exact conformity to the stringent insurance laws of New York, carries cash values, paid-up and extended insurance privileges. For this special offer it is modified to reduce the premiums to one-half of the premiums payable after five years.

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$1.00 a month purchases

Age	Insurance	Age	Insurance
18	$1275	34	840
19	1248	35	813
20	1221	36	786
21	1194	37	759
22	1167	38	734
23	1140	39	708
24	1112	40	682
25	1085	41	657
26	1057	42	632
27	1030	43	607
28	1003	44	583
29	976	45	559
30	948	46	535
31	921	48	489
32	894	49	467
33	866	50	445

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Dept. 304, 511 Fifth Avenue, **NEW YORK, N. Y.**

I enclose $.....for $.....worth of insurance.
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Exact date of birth.....
Name .....
Street .....
City..... State.....

How Stars Succeed in Love!

● Learn how the most famous stars succeed in love; how they avoid the many pitfalls and malicious influences of Hollywood that work to wreck their happiness!

Fascinating Fiction Versions of 2 Great Talkies!

● Look for the fascinating fiction stories of Helen Hayes' new picture, "Another Language", and of "The Stranger's Return", featuring Miriam Hopkins, Franchot Tone and Lionel Barrymore.

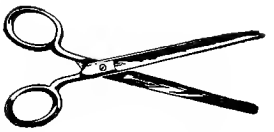
You'll also find a wealth of other absorbing reading including Peggy Hopkins Joyce's story in which she tells why she doesn't want a Hollywood husband.

SEPTEMBER

HOLLYWOOD

NOW ON SALE

● *If your news dealer is sold out, send 10c in stamps or coin to HOLLYWOOD Magazine, 529 South 7th Street, Minneapolis, Minn., and a copy of the September issue will be mailed to your address.*



TO MEN WHO WANT TO MAKE more money

You don't "get" raises these days—you earn them!

THESE are strenuous times in which we are living. Competition is keen . . . the demands for efficiency are constantly increasing.

The day is gone when you can "hit the boss" for a raise and get it "on your nerve."

You get raises these days on your ability — and your training!

Today a man must think about himself — and his future. Remember this: If you're just getting by, you're falling behind. Tomorrow your present job may be only a memory. The way to be sure of the future is to be sure of yourself!

Men are realizing this — a new era in the utilization of spare time to acquire specialized training is here! Men who a few years ago thought they were "sitting on top of the world" today are coming to International Correspondence Schools for additional training. Still more are enrolling because they see the handwriting on the wall. They want to make more money.

Do you want to make more money? If you do, we challenge you to mark and mail this coupon! It has been the beginning of success for men all over the world.

But don't bother if you're a quitter! It takes fight and hard work to get ahead these days—and weak-kneed, spineless men have no more chance of helping themselves by spare-time study than they have of getting a raise tomorrow!

If you have the old fight, if you're willing to risk a three-cent stamp on yourself —mark and mail this coupon *today!*

INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University"

BOX 2322-T, SCRANTON, PENNA.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Telegraph Engineer	☐ Automobile Mechanic	☐ R. R. Bridge and Building Foreman
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Name.....*Age*.....*Address*.....

City.....*State*.....*Occupation*.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

Odd's bodkins and a straw hat! Up yonder (under the hand so you'll recognize who we are talking about) is M-M's pride, the dean of practical American Naval Architects. The designer of such famous ships as Foam, Neptune, Tahiti and others stands ashore while a whole fleet of boats passes through a Florida lock! And, dressed in a straw hat, a white shirt, with hands in pocket he goes landlubber on his fans! Gents, it's John Hanna.

Andy's Shop Mail Box

Our owly Greasemonk returns safe as a goose from a long hop to the west, where climate is climate and a growing tree is a miracle. Barge in and get the new slant as Andy digs in.

WAL, me b'ys, this rambling rube and hedge hopping haviator is home from a long flugzeug across der desert to Los Angeles. You'll notice I spelt it Louse Angles when I said goodbye, but after a trip to that fair clime I'm spelling it with respect. Let me tell you—

I left Minneapolis about ten days ago and made Omaha the first night. Next day I made Cheyenne. Such lovely flat country I never flew over. You coulda come down any where and been on a dance floor. There aren't any crops to speak of and nothing would have bothered what fiction writers would call the "trucks" of my ship.

Salt Lake and south next day. Followed the Union Pacific down the green foothills to the desert, where it was plenty hot even at 4,000 and upwards. And into L. A. that night.

Home the same way after visitin' round a bit. and as the sun was a settin' I pushed the old Robbinsdale rooster patch down under the nose of the crate in the gloaming, and set the ship in. And just as she settled out from under, I spotted a black wraith smoking like a bullet across the field a la the Pony Express. The Black Thing was Parachute, our little shoat. He literally scooped sand in his hip pockets as he made out of sight in the lone gloaming, which you will claim is leaning some even for a pig.

Later in the dark he grunted oi-oi against the hangar door, but I guess he knew I'da up ended him and paddled him for being out alone at night, so he faded. How that pig lives stumps me.

* * *

And so to work. You'll be hearing this old sky buster's comments on the Far West on and off, so lets get into the line of stuff on the spindle.

* * *

Jack Hanna always makes good copy. Here's a letter from a Modish Mikkaniks reader down in another hot place. Hearken:

Clewiston, Fla.

Dear Geesemonkey Andy:

Tell me, old pal ole pal, was it the Sage of Dunedin? Was it John G. Hanna? Am I right, or am I a Republican?

Dunedin, Fla., dozed in the lap of a sunny summer Sunday morning. Out on the bay a White Leghorn roosterstail cut reckless circles around tactful tackful sailboats. Ahead of the roosterstail zipped a black hull with two arm-waving figures, astern blu-u-r-r-ed a snappy-revving motor. Down at the Dunedin Boat Club a coupla young fella's rove tackle on a 16-ft. racing sloop. Up at Jones' Pharmacy brave soda fountain sailors single-handed it around the world. Over in the shallow water around the Dunedin Yacht Club three row-boats slowly sunk their gunwales toward lowtide level via seepage.

But, hey, what's that? On past the Yacht

Club a black hull pulled up on shore glistens through the palms and pines. Going up closer I find it to be a dandy tabloid version of the double-ended Greek sponge-diver's workboat (the boat is double-ended, not the Greek) like those real salt-in-the-earsers and hair-on-the-chesters operate out of Tarpon Springs. (And don't try sponge-diving to build up your health, either, for these Greeks break down after not so many years of it, although they are raised in the business.) After taking this advice to heart, come back to the boat. She has a white water line separating the black freeboard from the red underbody, the trim is tan, and the trunk cabin is white. I am all eyes as I come up closer and circle around her.

Just as I made a demi-semi-circle, though, of a sudden up pops a duck-legged little squirt in brown tennis shoes, white clothes and grey hair. He shinnies over the side, down past a "WET PAINT" sign stuck between a shoring timber and the hull, and hikes up through a pretty grove of tall pine trees to a white house built with a garage on the ground floor. Duck-legs has the eye of a dreamer, the wrist of a draftsman, the muscle-bound gait of a sailor, and small clearance between his belt-buckle and his backbone. I made him out to be a Naval Architect.

Tell me, old pal ole pal, was it the Sage of Dunedin? Was it John G. Hanna? Am I right, or am I a Republican?

Yours truly,

F. M. Wright.

Eff em double you also encloses with his query a posteard like this:

Vote here:

√ Twere John G. Hanna

Twerent John G. Hanna

√ TAHITI will be in next issue?

Note: The checks show the way we voted.

* * *

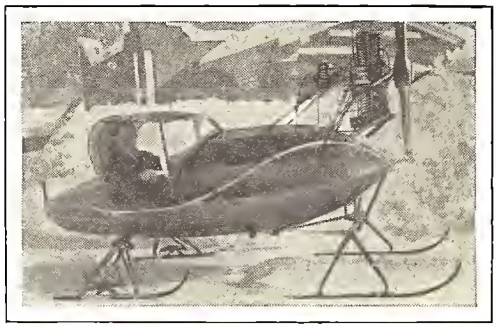
We publish at the head of this month's column a picture (first and only one ever published) of the Sage of Dunedin, sent us by a great good guy named O'Connor.

* * *

This old skeptic unearths herewith for sufferers from summer heat, a manuscript from J. K. Novins, of Frisco. I'm running it as is in a matter of fact way, for those who plan to skim and skid next winter. It has so much info that I know you'll gobble it up. The script by Novins, follows:

Here is a home-made snow sleigh that runs eighty miles an hour, propelled by an aeroplane motor and operated like a motor car. It is the invention of Harry Edwards, Wallace, Idaho, auto mechanic, and was constructed by him from spare parts. He has run it in town and up steep mountains where automobiles could not go. It is capable of slowing down to walking speed, being operated by foot pedal as in an ordinary motor car and is equipped with powerful brakes.

A 60 horsepower Anzani Aeroplane motor furnishes the power. Edwards rebuilt this six cylinder motor with connecting rods of his own design, including the oil pressure and scavenger pumps. The main hulk of the sleigh is built of steel tubing, with all joints welded. The steering apparatus is like that of a motor car, except that cables replace tie rods to control the runners. The gas



Harry Edwards of Wallace, Idaho, built this 60 h.p. welded steel snow sled. A de luxe job, a la sedan and everything!

tank holding fifteen gallons is in the extreme rear end. The pressure feed and gauges are located under the dash in front of the driver. The aero sleigh weighs 400 pounds and has an overall length of ten feet. It can turn around in twice its length.

The sleigh has a seating capacity for two, the seats being upholstered in dark brown. The top, or inclosure, hinges up, to permit entrance. The lower part of the body, including running gear, is painted red, and the upper part is in black, giving the sleigh a nifty appearance.

* * *

Bill Downey, from the forgotten wilds of Staten Island, New York, sent us an interesting letter about his activities, together with a shot of himself poring over apparati in his lab:

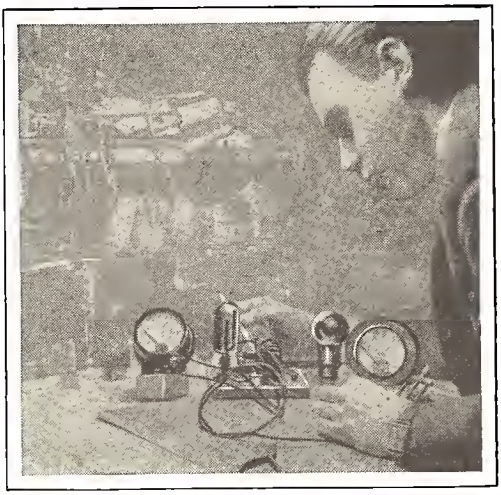
32 Avon Place

Tompkinsville, Staten Island, New York.

Dear Sir:

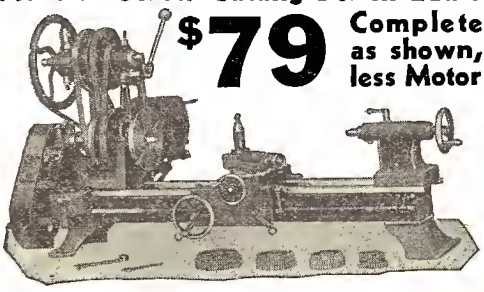
In the near future I was thinking of constructing a car built after the lines of a racer. "Modern Mechanix" mags ran some designs which were not to my taste, so I am writing to you; perhaps you could help in getting ideas for the construction of such a vehicle.

(Continued on page 12)



M-M reader Bill Downey is here shown working with p-e cell stuff in his home lab at Staten Island. Lucky to have that shop set up, isn't he? Tell us more about your photo work, Bill.

Atlas 9" Screw Cutting Bench Lathe



$79 Complete as shown, less Motor

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WOODWORKING. This lathe can be used to work wood as well as metal. High Speed Pulleys to convert for woodworking cost only $5.25 a set.

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Do it with SMOOTH-ON

ANDY'S SHOP MAIL BOX

(Continued from page 11)

The car designs by Earl Hilburn are very good for those who like a cart of ultra simplicity, but are rather a disappointment for those who want something that looks like a Miller.

Your photo-electric stuff by R. F. Yates is rather interesting. I have enclosed a photo of a selenium and a photo-electric cell that I have been working with.

Would like to see some photo finishing work in your mag.

Enclosed is a picture of the outfit I have worked with.

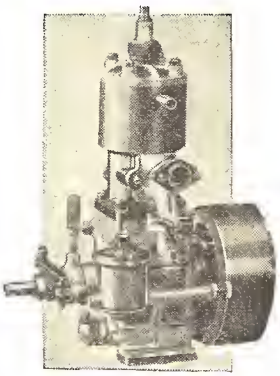
This machine contains automatic lights, moves plates in developer automatically, can make enlargements, photostats, etc.

I have every issue of your mag so that tells the story if I like it or not.

Yours truly,
Wm. Downey.

We canna please everybody, Bill. Suppose all you who want to see different things in the old ship just send in a one page letter with the stuff you want listed thereon. I'll see you get it if it's in the breeze at all.

* * *



We can put you in touch with makers of midget engines like this one. Drop a line to Andy, stating needs.

A lot of mail I find to be asking for midget gasoline engines like the one shown in the cut, or a little larger. We know of several manufacturers who are in a position to supply these, and if you'll drop me an addressed and stamped envelope with a short query about your needs, I'll see that the proper firm gets your letter. And if you've got an old motorcycle engine you want to sell or if you want to buy one, send a short note concerning requirements and I'll try to put you in touch with a source.

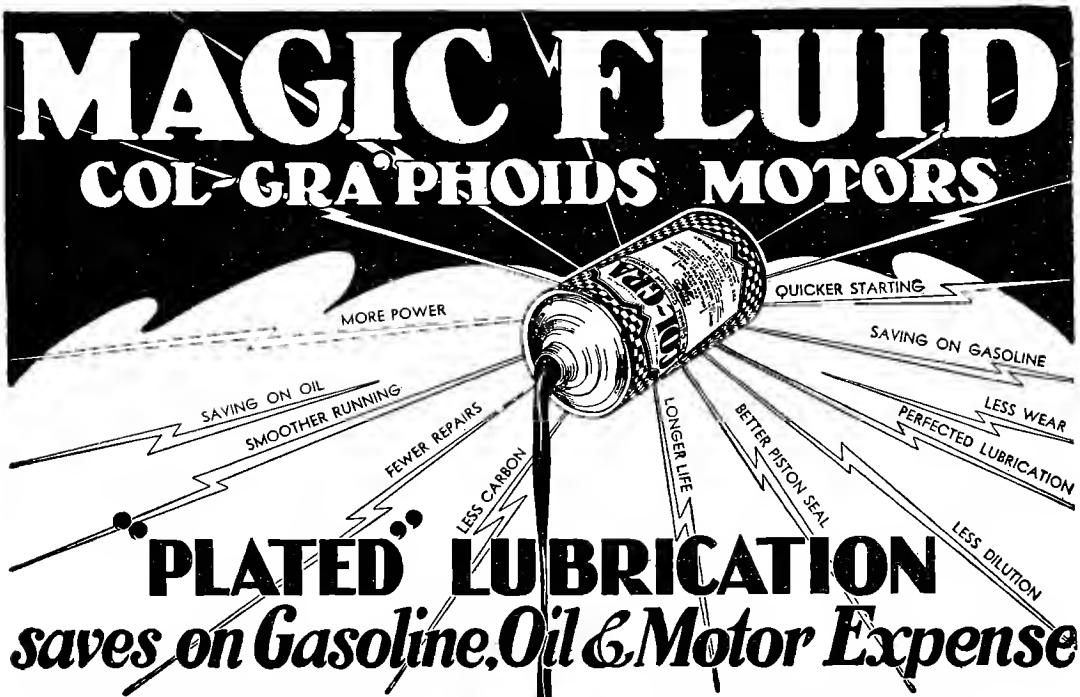
Incidentally, we have a few motors on hand here that are new ½ h.p. Johnson Utilimotors, suitable for driving midget cars, light plants up to 100 watts, water pumps, etc. These have mags, carburetors and tools, and we've sold a bunch of them at $20.00. First come, first served!

* * *

Old Karl Ort, of York, Pa., is the livest wire in the new and used airplane materials business. He has a catalog which will delight all you lightplane bugs that have been writing this doddering old inkslinger in times past wondering where you could buy supplies cheap. Karl will be glad to send you his catalog, if you mention my name. Also will some bird in Canada tell me where I can get supplies for Canadian customers? This duty business is the nerts—40% and then some.

(Continued on page 16)

MAGIC FLUID
COL-GRA'PHOIDS MOTORS



"PLATED" LUBRICATION
saves on Gasoline, Oil & Motor Expense

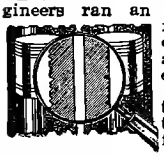
AUTOMOBILE, Airplane, Tractor, Truck and Machinery Owners! Think of it! A revolutionary discovery now "plates" lubrication on all moving parts. Automobile owners, airplane pilots, engineers and other Col-gra users, are amazed at its action. "Like Magic" is the best description of it.

REVOLUTIONARY DISCOVERY

Added to the oil and gasoline, Col-gra seeks all friction parts, where under heat, speed and pressure, it quickly forms an almost **frictionless Col-gra'phoid surface.** This means smoothness—quicker acceleration—amazing savings on gas, oil and repairs. Col-gra's patented ingredients manufactured at 7500° assure positive lubrication. No motor heat too great. No temperature too cold. Gasoline cannot wash it off. It stays put!

PROVEN BY TESTS

On a recent test of a Col-gra'phoided motor, four engineers ran an automobile, without the slightest motor injury, for **29 miles without oil,** proving beyond all doubt the ability of this surface to lubricate even in the **complete absence of oil.** Laboratory tests further show the amazings difference between treated and untreated friction surfaces.



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PAYS FOR ITSELF

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Col-gra users everywhere are enthusiastic. "I am pleased with results," writes Frank Eastwood. "The motor's smoothness is almost beyond belief. My mechanic says it can't be the same engine." Paul Canalizon: "Col-gra gives the car more power—speed—pep and gas mileage." W. P. Barrows: "My car runs much smoother, uses less oil and has more pep." E. C. Bergman: "Col-gra helps the motor a whole lot—is working more freely and less vibration."

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Every car owner—every user of machinery of any kind should know about Col-gra "Plated" lubrication. Go to your dealer and ask for 32 page illustrated Col-gra booklet, or mail the coupon below and obtain this 32 page booklet free.

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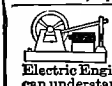
Boy Electrician



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With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.**

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It looks like a deadly weapon, but it is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest it might be loaded. Pull the trigger and the slide flies open disclosing the cigarettes. Well made, light and compact. Weight only 2 ounces.

Send at once and have all the FUN before everybody has one

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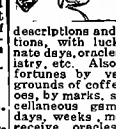

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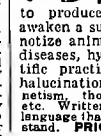

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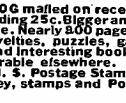

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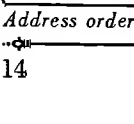

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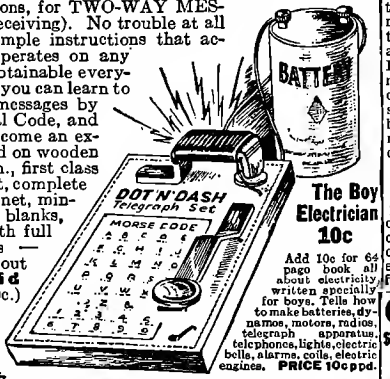

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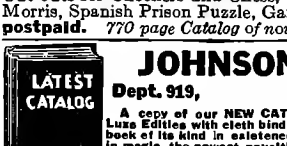

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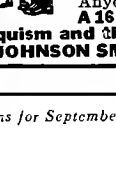

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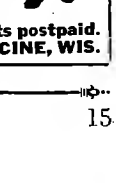

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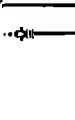

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ANDY'S SHOP MAIL BOX

(Continued from page 12)

Russell Manka, of Lamar, Colorado, is a rabid motorcycle fan, and builds his own angel makers. This is a rolling collection of old parts, soon to ramble.

This subject of baby cars, midget autos, racers and track cars, and motorcycles is one which won't be downed. Witness this letter from the motorcycle and angel-making expert Russ Manka of Colorado:

Lamar, Colorado.

Dear Andy:

Kindly allow me to register a kick on the way the sickle fan is being neglected by M. M. If you will attempt one little think on the subject you will realize that it costs less to own a motorcycle than either a plane or a boat. The motor for the plane or the boat will cost as much as the motorcycle. That one fact will be cause enough for more motorcycles than there are planes. In fact, if you have a sickle you may already have the power plant for your plane when, if, and how you are ever able to build it.

Some time ago one of your self-appointed critics suggested a Motorcycle and Auto Manual. I heartily second the motion. While I am able to soup up a motorcycle motor till it is putting out the last horsepower I would like very much to have some kind of a reference book on the subject. I have been a rabid motorcycle fan since the day of one cylinder, belt drive, pedals for auxiliary power.

I am enclosing a picture of a miniature motorcycle I have under construction with both the reasons why I cannot afford to finish it at once. Wheels are 20x2 off a Culver cycle car, motor is an old Smith motorwheel and the frame is made of bicycle frames and gas-pipe, pinch-hitting for steel tubing. Drive, which has been added since the picture was taken is Vee pulleys and a Model V8 Ford fan belt. Have no provision to date for brakes so may have to carry a chain and anchor.

Yours truly,

Russell Manka,
Box 452.
Lamar, Colo.

—a neat effort, Russ. And if any of you gents have a thought on that auto handbook idea, let me hear what you'd think an ideal cargo for such a job would be.

* * *

This super-shrunk cabin trailer is the work of Mel Thompson, who flies it behind an Austin.

We've run pix of all kinds of trailers, and plans for a few. But it remained for Meldrim Thomson, Jr., to send us the midget of them all —a trailer cruiser he built for his Austin. Here she is up above. Neato le babeee pour le auto, or somepin'.

* * *

Incidentally, "All Sorts"—the 10-foot dinghy is second to "Scram" in popularity. We've got a selection of pictures of All Sorts that have been built from Maine to Manchuria. See 'em next issue, boys!

* * *

While I don't think the alleged error is of a nature that could be overlooked by a thorough workman, and while Mr. Dunnan may or may not be right, we thank the gentleman for preserving for future use 1,095½ readers who might be blown to perdition if the dire things Mr. Dunnan says are so:

Sidney, Ohio.

Dear Sirs:

I have been a reader of your interesting mag since 1928 and feel that since I have discovered a mistake in one of your articles it is my duty to write you about it lest someone be hurt or killed. The article I refer to is the acetylene generator shown in the July Modern Mechanix. You forgot to show a packing gland and nut on the 1¼" auger where it comes through the side at the carbide tank which would let gas escape and cause an explosion endangering the life of the welder. I would advise running a correction in the next mag if you can. The packing box should be packed with a non-grease or oil compound such as tinfoil and flake graphite. I was interested in building the generator for my own use and thus I noticed the omission of the stuffing box.

Yours for a good mag,

R. H. Dunnan.

P. S. I have been welding for several years with tank gas and I thank you for the generator sketch for it will save me lots of money by the difference in gas price.—R. H. D.

New Canned Wood Makes All Home Repairs Easy

Newly discovered wood that comes in cans makes it easy for anyone to keep home in first-class condition. Handles like putty, just as soft. Quickly hardens into wood, like natural wood. You can paint, carve it. Drive nails or screws into it. It's PLASTIC WOOD. If you have a broken chair . . . loose caster, ugly nick . . . crack in floor, hole in wood, plaster or tile, loose drawer pull . . . rotten spot in wood to replace . . . do a quick, expert, permanent job of repairing with PLASTIC WOOD. Results will surprise you. Paint, hardware stores sell PLASTIC WOOD for 25¢ a tube, 35¢ a can

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READ RADIOLAND EACH MONTH—It's the Ace Magazine of the Air.

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Flying With Piccard in Stratosphere

(Continued from page 54)

to make the metal shell as airtight as is humanly possible. The dowmetal (special magnesium alloy) shell is thoroughly x-ray tested and all the glass ports through which the earth below is viewed are firmly sealed.

Inside the cabin, where Piccard and Lieut. Com. Settle, his assistant, must live for 20 hours or more, there are found all the comforts of home, along with a clutter of scientific instruments. On a small electric stove the scientists can cook meals in the sky. Nearby is a radio transmitter to communicate with the world below. On another shelf is a strange device devised by Prof. Compton of the University of Chicago to measure the intensity of the cosmic rays, and next to this is a camera directed down through a special port in the floor.

Ranged along the floor is a battery of cylinders containing liquid oxygen. When an altitude of 15,000 feet is attained the manholes are closed and bolted, and the oxygen valves opened for the rest of the journey to create a livable artificial atmosphere. This arrangement maintains a pressure about six-tenths that of the atmosphere at sea level.

The climb into the upper air begins about 11:00 o'clock at night for at this time no torrid sun's rays beat down on the gas bag to cause excessive expansion of the hydrogen. Low buoyancy thus permits a gradual, controlled ascent.

At 15,000 feet, which is attained early in the morning, the fliers close down the manholes. When the sun rises, the ascent begins in earnest. Piccard then begins throwing out ballast—sandbags hung from the gondola and lead dust ejected through a special valve in the cabin.

This procedure continues up through the troposphere and into the stratosphere, which begins at six miles above the earth. Meanwhile, overhead the sun's rays, unimpeded by the gases of the lower air, along with the diminishing atmospheric pressure, are swelling the fabric envelope into a gigantic sphere.

At about mid-afternoon, the scientists reach their maximum altitude, 11 miles, thanks to the purity of the hydrogen and the lightness of the metal gondola and equipment. Here what is known as the pressure height will be reached; the bag will have reached maximum inflation. Further expansion is relieved by the flow of the gas out of the valve on the bottom of the bag.

Descent now begins. The pilot pulls on a cord leading up through the cabin shell to the gas escape valve in the top of the bag. Slowly the stratosphere balloon falls earthward. Down, down, through the stratosphere and into the troposphere. Hydrogen flows freely from the valve, till at last old terra firma comes into view through the haze. Then, just as the gondola is about to strike the ground, the rip cord is pulled, cutting a huge gash in the top of the balloon and allowing the remainder of the hydrogen to return to the atmosphere. The bag collapsed, the sky-fliers crawl out of the manhole in the gondola, and another chapter is written in scientific and aeronautical history.

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your ideas

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(Continued on page 22)

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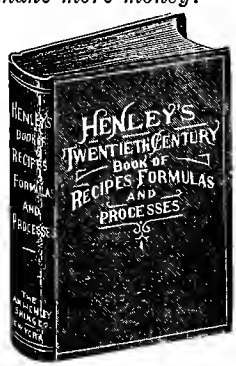

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SCRAM—Newest addition to the boat plan list. She is 15½ feet of dynamite, inboard motored—will do around 40 with Ford A engine. Forward and aft cockpits, with motor between. Can be built in a garage, and is a flashy performer. Prints include drawings for marine conversion of Model A Ford motor. Blueprints $3.00

AUTOS

BUNGALOW TRAILER — The most popular trailer design ever published; thousands have been built. Two wheeled, folding design—folds together compactly for traveling, can be opened up in camp. Weatherproof; built-in beds for four adults; running water, household comforts. About $30 should build her—much less, if you have a few parts lying around. Wheels and axle from most any discarded car chassis will do. Blueprints $1.00

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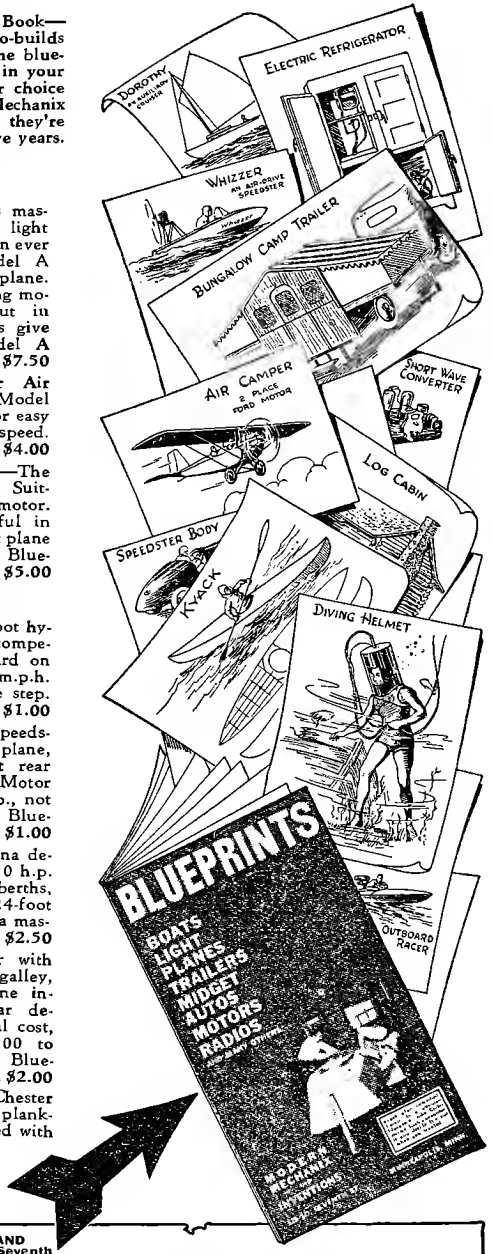

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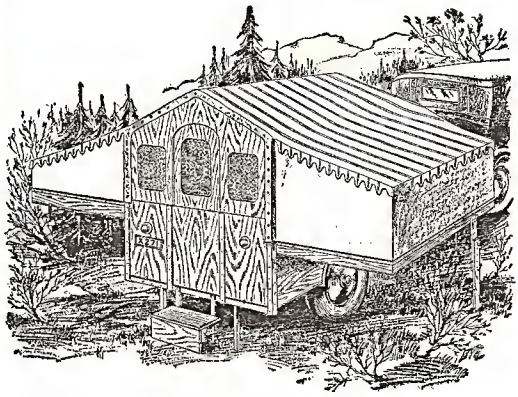

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NO WONDER this trailer has proved to be the most phenomenally popular how-to-build project in years! Literally hundreds of them have been built since the plans originally appeared in the May, 1932, issue of Modern Mechanix and Inventions. The illustration above shows the outfit in camp for the night, unfolded as a house. For traveling, the side balconies are folded inward, the roof top down, and presto! you have an easily towed trailer which allows complete vision from the rear window of your car.

BLUEPRINTS show the trailer layout with all dimensions. Prints are large size, specially made for shop use, easy to read. Any man who can tell a hammer from a saw can put this trailer together to last for years. Price of blueprints, postpaid **$1.00**

Modern Mechanix and Inventions
529 S. Seventh St. Minneapolis, Minn.

Prize Awards in Gyroscope Contest

(Continued from page 81)

ward or up and down. All that the gyroscope can resist is an effort to twist the wheel from its axis.

Thus theoretically the scopes would be a great aid as long as they were rigidly held by **both hands** and carried directly along the path of march.

However, if the rope walker held one side of the balancing arrangement, and was not able to keep the stick from falling about his wrist as an axis, it would immediately precess violently, and might tend to knock him off the rope. We leave it to you: it's a big help while under control, and would be a menace if the contraption got out of hand.

Mr. Healey's letter is run to elucidate these seemingly moot points. We feel sure you will concur in our judgment that he has summed up an intricate matter succinctly and in plain words.

Delano, California.

Modern Mechanix and Inventions,
529 7th Street So.,
Minneapolis Minnesota.

Gentlemen:

The man shown on the cover of your June issue can fall, however, the gyroscopic device could be of great help to him.

A gyroscope resists only such motion as would twist it upon its axis and it may be moved as freely as the same amount of dead weight in any direction a person may choose so long as its axis is always pointed the same direction. Should the rope walker start to fall sidewise and thrust his balancing rod to one side in an attempt to save himself, he would find that it was of no more benefit to him than the ordinary balancing rod. If, however, when he found himself about to lose his balance, he attempted to depress the side toward which he was about to fall and at the same time raise the opposite side of the rod, the rod would resist such action and he would be able to bring himself to an upright position again.

It is essential that the rotors turn in opposite directions as each time that the axes of the gyros are twisted in the man's attempt to maintain his balance, their motion is partly killed and in accelerating again a twisting effect on the rod would have to be offset by the intensity of the man's grip. But, a more necessary reason is that when one side of the rod is depressed the gyro on that side in resisting the action would tend to move backward (if the top of the rotor were spinning forward) and the gyro on the other side would move forward, thus twisting the man off of the rope. If the rotors were turning opposite directions this fault would be partially overcome.

The rod could be held in one hand only for short periods, unless it were grasped exactly in the middle as the gyro on the long end of the rod would have the greatest lever-

(Continued on page 27)

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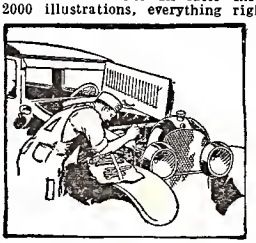

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War Fought With Deadlier Weapons

(Continued from page 51)

flanges as the bullet speeds towards the muzzle.

Decided advantages are represented in this arrangement. The large cross-sectional area of the bullet before firing offers a maximum surface to take the full force of the explosion of the powder, while small cross-sectional area of the "compressed" bullet emerging from the muzzle of the gun reduces wind resistance, and hence loss of velocity, to a minimum.

It is this combination of features which accounts for the bullet's terrific velocity of 5,000 feet a second, nearly double that of standard army rifles, and gives it distinct advantages. The line of flight, or trajectory, is flattened to a minimum so that soldiers need not trouble about adjusting their sights when firing at distant objects. Also the time of flight from rifle to target is greatly shortened, a highly important feature for anti-aircraft machine gunners firing at a fast-moving target.

Above all, however, whizzing at extreme velocity, the bullet drives straight through the hardest tank armor. At such speed, the inventor claims, the projectile has no time to flatten out on striking a hard object; it goes through the steel like a straw goes through a board in a tornado.

Military authorities see many tactical advantages in this new Gerlich bullet and its adoption as a standard instrument of war is expected. The next development to be looked for is an anti-anti-tank bullet armor, and following this, an ultra-high velocity bullet.

The next war will also see another new convenience in the art of machine gunning—a phosphorescent bullet which shows the gunner what he's hitting when he fires into the darkness of the night. Heretofore night shooting has been nothing more than pot-shooting. Except when a parachute flare illuminated the battlefield, the gunners were firing blindly into blackness.

Developed recently by the English Chemical Warfare service, the bullet has a phosphorous nose that creates wherever it strikes a luminous splotch, enabling the gunner to get the range of his target, and eliminating all guesswork.

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Los Angeles Races Prove Thrillers

(Continued from page 36)

to Maj. Ernst Udet, German ace who drove to earth 62 allied planes during the World War, and Lt. Tito Falconi, youthful Italian Royal Air Force pilot.

European Wizards at Controls

These European wizards of the air displayed a prowess few in America have seen. Maj. Udet, particularly, demonstrated the ingenuity Germany has shown in developing aeronautics despite the bans of the Versailles peace treaty. He flew his seven-year-old Fokker biplane, powered by a 150-horsepower Siemens motor—considered by American speed pilots to be something akin to a toy—with such skill and daring that a tremendous tribute was paid him.

Imagine, for instance, pulling the ship up into a whipstall—straight up until the engine pulls the plane down—only 300 feet above the grandstands; looping the loop with the engine shut off; picking up a handkerchief from the ground with a hook tied to one wing!; barrel-rolling from the ground.

Or picture 120-pound Falconi, picked from 400 pilots to represent Italy, roaring down and up in an outside loop, passing within 100 feet of the earth; flying along the ground with his wings vertical, held aloft only by his 400-horsepower engine; climbing straight up hundreds of feet, pulled aloft by his powerful motor.

Two pictures of European aviation since the war—the vanquished and victor! Stunting, true: but typical of progress in those countries.

Loops Auto-Gyro

When the crowds tired of thrilling at these hair-raising episodes, they watched Lt. Johnny Miller loop-the-loop in his auto-gyro. Here was something brand new for National Air Racers, yet the flying windmill looped, whip-stalled and performed wing-overs with the same ease as an airplane.

I have seen many parachute stunts, including delayed openings, or free-falls; which means that

(Continued on page 31)

Prize Awards in Gyroscope Contest

(Continued from page 25)

age and its twisting motion would dominate giving the entire device a horizontal, rotary motion.

One using this rod might not understand that it would not resist a side thrust, or he might place his weight on one side for too long a period and be twisted from the rope by the horizontal rotation which would result. However, a little practice would enable one to master the eccentricities of the device, after which it would be of value.

Yours respectfully,
Emmett Healey.

We thank all of the hundreds and hundreds of contestants for their interest, and wish to remind that under the conditions the letters not winning cannot be returned, nor can we enter into correspondence concerning them.

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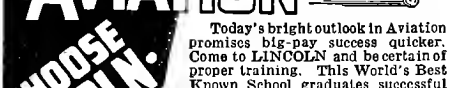

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Facing Death to Tame Jungle Cats

(Continued from page 60)

Having selected my pupil, I must next "barrel-break" him. An animal is not expected to tackle so difficult and elusive an object as a globe without some preparation. What is chosen for this is a barrel-like cylinder whose surface is covered with a thick matting that enables the animal to dig in with his claws and keep his footing.

First the pupil is pedestaled a number of times in succession. Then the pedestal is removed and the cylinder is put in its place. But so that the pupil's task may not be too difficult, the cylinder is held firm by means of sticks nailed to the floor. The idea is to accustom the animal to one new thing at a time.

When the pupil is used to his cylindrical roost, I have the sticks that hold the cylinder firm moved down a foot or so. The cylinder, which is set on a "skid," or track, starts rolling, and for the first time the animal is faced with the problem of balancing himself on a moving object. When his footwork is good enough to enable him to hold on over this short distance, the sticks are so that the cylinder has an additional foot's play on the skid.

Sometimes this is too much for the pupil and he goes toppling to the floor. After about a dozen tries, however, he usually learns to balance himself over this short distance. At the start, the amount of roll to which an animal is subjected is slight. It is controlled by an assistant and me, each of us carrying a T-shaped stick. Because my assistant stands outside the arena, the stick has to be much longer than mine. His job consists of shoving the cylinder from behind and making it roll.

This is the only way we can hope to move a mat-covered barrel on which is perched several hundred pounds of jungle cat. When my assistant finds it difficult to move the cylinder, I assist him from my post inside the arena.

Once the animal is able to feel at home on this device, he is ready for a try at a regular globe, although, in the beginning this is also covered with matting as an aid to surer footing. The globe used is a heavy one made of solid wood, two-and-a-half feet in diameter. This, like the cylinder, is placed on a track. At the start the globe is permitted to have no play and the animal is cued to mount it as though it were a regular pedestal.

When he has grown used to this new perch, he is put through the rest of the routine that was outlined in connection with the matted cylinder. The wooden bars holding the globe stationary are moved until the big wooden ball has a fair amount of play. When my new globe-roller has learned to balance himself with the sphere in motion over a distance of a few feet, the bars are removed and I set to work on more intricate acts.

In most instances, when I step into the arena for the first time with an untied and untried beast, he will halt in his tracks and stare hard at me. His next move is most significant. Either he will conclude that I have no intention of harming him or he will consider me an enemy that he has to fight. If he looks upon me as an enemy, he

Facing Death to Tame Jungle Cats

will spring straight at me and try to knock me down.

When these early rushes are made by lions, I do not mind them much. Lions are great bluffers and when I stand my ground and meet or sidestep such a rush, it is seldom repeated. My maned beginners don't know just how to take me, and when an experimental rush accomplishes nothing, they calm down.

It is the first rush of the tiger that worries me most. When a striped cat comes tearing at me, I use every ruse at my command to defend myself and to make plain to him that I am the boss. To me the arena is familiar ground, while to him it is a strange place; and this gives me a slight advantage, although it doesn't alter the fact that I have to fight off a determined tiger, which is a very real problem.

Most trainers on leaving the safety-cage, to face an animal, shout to the beginner. As I slowly and cautiously leave the safety-cage, I start whistling. I find this the most effective way of saying "howdy." The first day, I do not venture very far from the cage, I frankly admit; it is a grand retreat in an emergency. The next day, I go farther into the arena, until, after a few days, I am face to face with my new charge.

Oddities of Science

(Continued from page 71)

Each of the following strange facts about science which upset some of our well established acceptances of things in nature were submitted by M.M. readers to Nic Sprank, and checks for the w.k. dollar were promptly mailed.

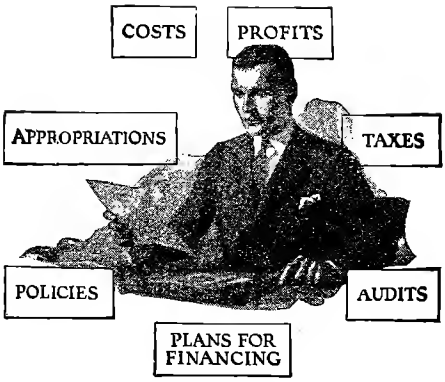
Probably the most interesting was the one submitted by Dennis Arnold, of Carlisle, up in the State of Washington. Mr. Arnold points out that in the wild animal export trade in Africa the most convenient way to weigh newly-captured pachyderms is **without scales!**

The beasts, which would be rampaging if in harness, are usually taken as semi-grown, and will "stand to halter" nicely on the Trading Co.'s barge. The displacement of the barge is then measured, giving a fairly accurate basis for the steamship company to charge for the tonnage. Weight is the basis for all steamship rates.

Joseph Mackona, of East Hartford, Connecticut, among others points out that a dry cell is not dry! He wins over others who submitted the same oddity by pointing out why. The electrolyte in the battery is really wet, held in suspension by sand, paper pulp and other substances in a saturated condition.

Lieut. Don Benn Owens, Jr., stationed at Dayton, Ohio, shows that water will **start a fire.** Potassium and water burn violently when brought together.

Jack Bakke, of Wenatchee, Washington, is right when he says that the sun's rays in themselves contain no heat! The rays set up vibrations in the objects they strike, and the objects, as a result, become warmed. If the sun's rays themselves contained the heat, all objects would become warmed equally.



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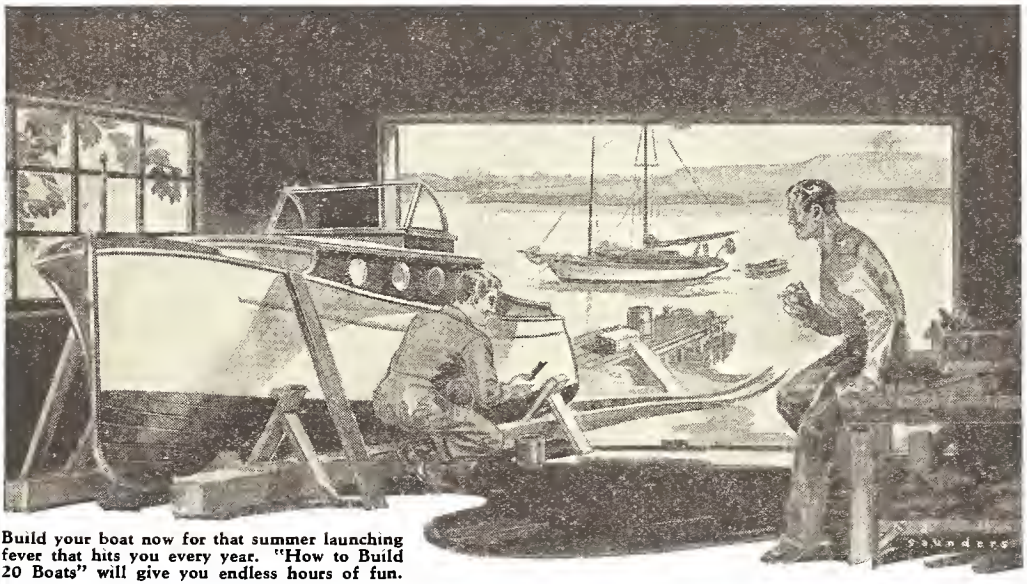

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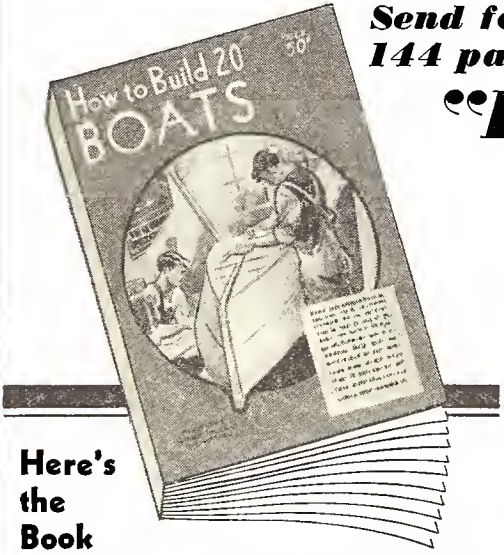

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Los Angeles Races Prove Thrillers

(Continued from page 27)

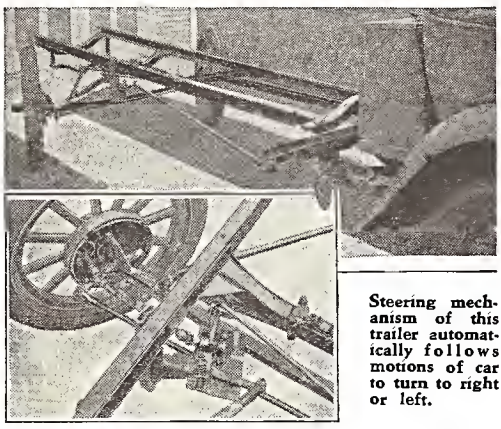
the jumper "bails out" and drops a long distance before pulling the rip cord. "Spud" Manning, a jumper of long experience, made even old-timers gasp when they strained their eyes up at the same auto-gyro and saw the tiny jumper leap overboard at an altitude of nearly 15,000 feet. Manning added a touch of stellar showmanship as he fed into the open air wisps of white smoke —really flour—the while he twisted and turned on his earthward plunge.

Manning Has a Real Thrill Stunt

Down through the sky the floury trail marked his course, though few could see his body as it hurtled downward. After a time the flour was exhausted, the trail disappeared. Then, a mile below the last white puff, the billowing silken canopy snapped open; but not even yet was he safe, for he was suspended beneath a 'chute only 24 feet in diameter. To break his fall further, when a thousand feet above the field, the jumper jerked a second rip cord, and another parachute flew out to slow him down to a safe landing.

National Air Races are the crucible in which manufacturers and individuals who think they can build faster airplanes test their products. Here the little fellow gets his chance. Wedell built Turner's plane and saw Turner outrace him in the two feature events—but he had the satisfaction of knowing he had been defeated by his own handiwork in which an engine of fully 200 more horsepower had been installed.

A TRAILER YOU CAN STEER



Steering mechanism of this trailer automatically follows motions of car to turn to right or left.

Last word in towing convenience is this trailer chassis which steers just like an automobile. In fact, when towing it all you have to do is steer your automobile and the trailer automatically follows the car's motions. No unhooking—no awkward maneuvering in city streets or other crowded quarters.

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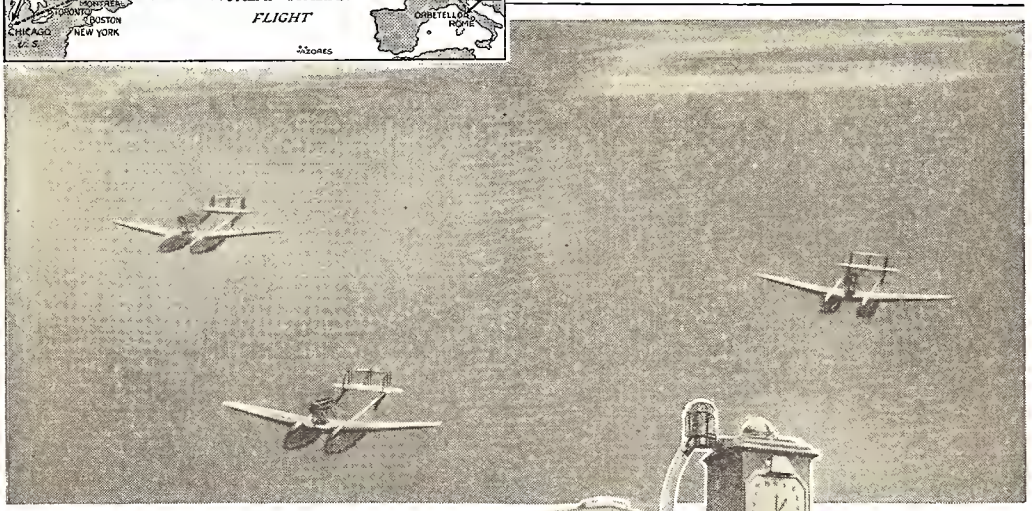
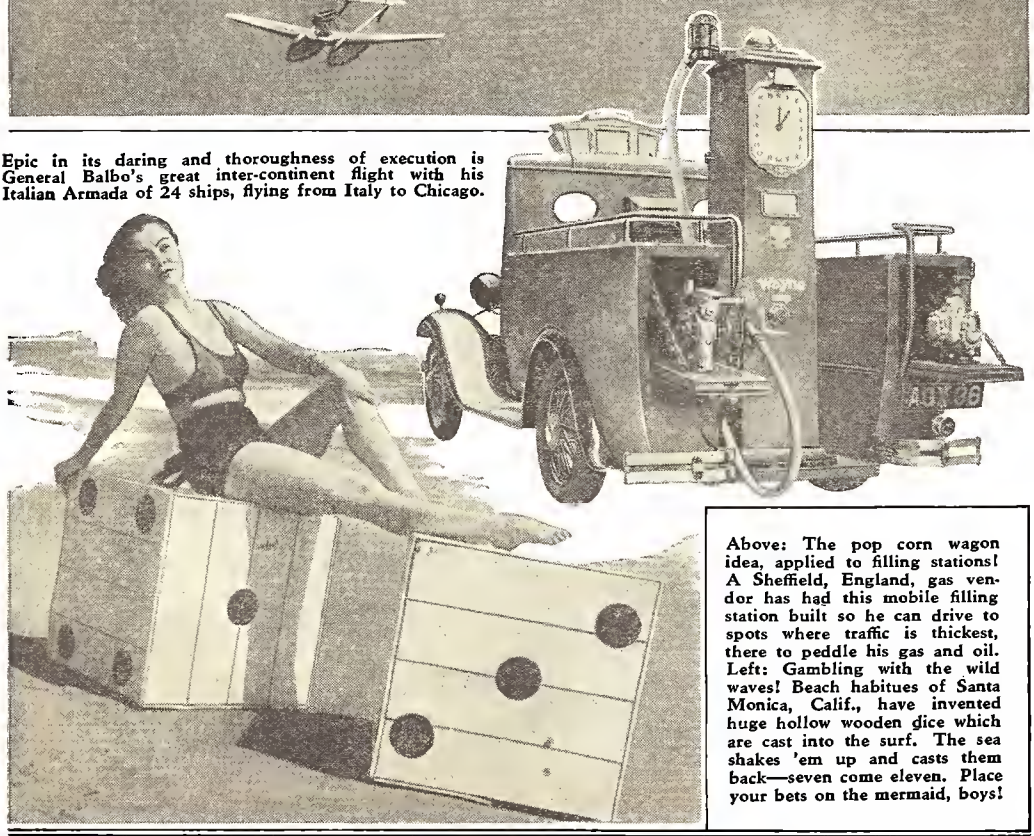


Epic in its daring and thoroughness of execution is General Balbo's great inter-continent flight with his Italian Armada of 24 ships, flying from Italy to Chicago.



Above: The pop corn wagon idea, applied to filling stations! A Sheffield, England, gas vendor has had this mobile filling station built so he can drive to spots where traffic is thickest, there to peddle his gas and oil. Left: Gambling with the wild waves! Beach habitues of Santa Monica, Calif., have invented huge hollow wooden dice which are cast into the surf. The sea shakes 'em up and casts them back—seven come eleven. Place your bets on the mermaid, boys!

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NEWS *of the Month*

that capture the public fancy.

The Informator of Berlin answers foreigners' queries in their own language as they slip a coin into the works to find what's about it.

Above: A "wellen-tumbler," as the Germans call it, will teach you how to swim like a motorboat. Just strap it around your neck, wind her up and let the machinery do your swimming! What ho for the life of a sailor! Right: A clever San Francisco attorney, Joe Garry, uses movies of an injured man petitioning for insurance damages to show the claimant doing a good job of polishing a car while allegedly laid up.

LOS ANGELES RACES

by JAMES BOWLES

ROARING across the continent in 11 hours, 30 minutes, Col. Roscoe Turner not only clipped 63 minutes from his former east-west trans-continental speed record, but he inaugurated something new in the way of planning his route.

The speedy Wedell-Williams low-wing monoplane which Col. Turner piloted has flown in excess of 300 miles an hour, although his average speed across the continent was a little less than 250 miles an hour. At that velocity, he cannot afford to fly through rain storms.

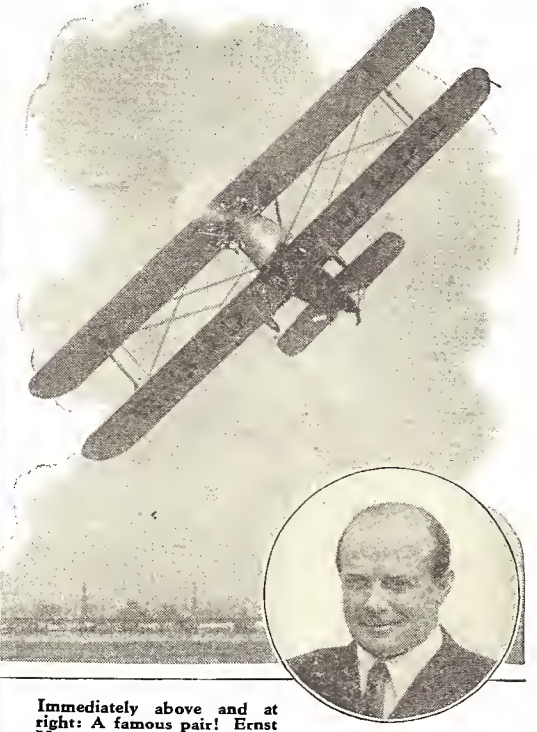
Avoids Rain by Phoning

Accordingly, the night before he took off from New York, he telephoned to Los Angeles, where California Institute of Technology scientists recently announced a new system of weather forecasting so accurate they can predict where storms will gather anywhere in the United States. At two points along the route, Turner was told, he would encounter showers.

Gordon Israel, 22-year-old pilot from St. Louis, and his special Menasco 6 of 180 h.p. With less than 20 foot span this ship can do 200 miles easily.

Lieut. Tito Falconi, youthful Italian ace, who did barrel rolls right off the ground!

Hollywood stunt pilots paint their flaming way with smoke trails as they cut capers around one of the pylons. In one of these dashes, Hoot Gibson, cinema actor, was hurt.



Immediately above and at right: A famous pair! Ernst Udet, of war fame and present day air show acclaim, and his 7 year old Fokker biplane which had the whole grandstand agog day after day by picking up handkerchiefs with a hook on his wing tip, not to mention looping off the ground and upside down flight ten feet off the terra firma. Udet surpassed even our own Johnny Miller who cut capers such as loop-the-loop and barrel-rolling an auto-gyro.

Prove AIR THRILLERS

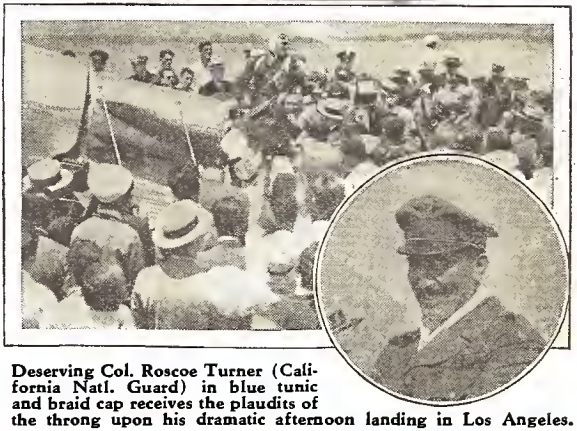
More and more power and less refinement of streamline design is the cry of present day designers as proved by contesting planes in great 1933 Los Angeles Air Races. Flown across country by an eye witness this up-to-the-minute account of the past year's aviation progress summarizes records, achievements and points out the races' thrills.

Blasting his way 2300 miles in 11 hrs. 30 mins., Col. Roscoe Turner in his Wedell-Williams racer (right) set a new trans-continental record.

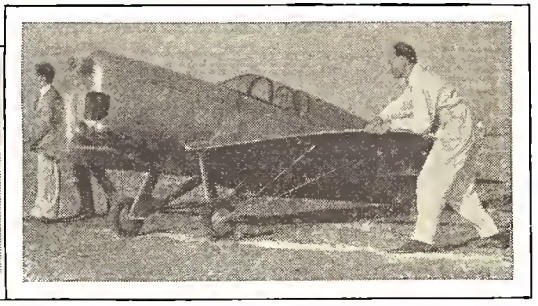
Although he was instructed to turn slightly south from his course between two of his stopping points, Col. Turner added the extra miles for safety and slid down to a three-point landing early in the afternoon, a half hour ahead of his nearest competitor, Jimmie Wedell.

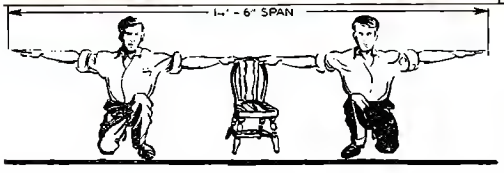
Increases in Power

This year's races saw more power pouring from the already powerful engines used in the tiny racers. Last year Maj. Jimmie Doolittle won the Thompson 100-mile dash with a 750-horsepower engine pulling his monoplane through the air at Cleveland. This year, Col. Turner won the same epic event with the engine "souped up" to nearly 1,000 horsepower!



Deserving Col. Roscoe Turner (California Natl. Guard) in blue tunic and braid cap receives the plaudits of the throng upon his dramatic afternoon landing in Los Angeles.

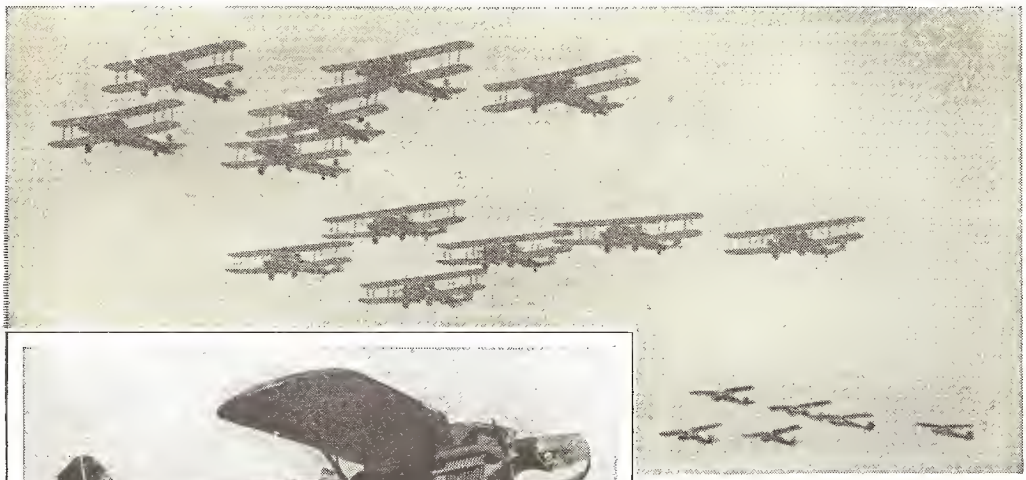




The "Clipper"—375 cubic inch class racer by S. J. Wittman, of Oshkosh, Wis., has a wing span of but 14 ft. 6 in.

Many of the midget planes were hooded for greater comfort for the pilot. All starts were racehorse starts, the groundmen holding the ship until the motor was ready.

True, Col. Turner did not reach the speed attained by Doolittle, for fairly heavy cross-winds impeded the racers at Los Angeles. But the increased power indicates the trend in racing. More power instead of more streamlining. The blunt-nosed fuselage has



The Douglas gull wing army bombers nearly stalled in an effort to trail the old types.

Here's the Douglas 200 mile an hour gull wing bomber that can fly 4,000 lbs. to a height of 20,000 ft. ceiling. It has a hard time slowing down to even the highest speeds attained by the biplane bombers of yesteryear.

The Howard, clipped a little from last year, was again favorite and won the 375 cu. in. events quite handily. This ship shows influence of low wing progress.

been accepted as the prevailing style for the larger planes, though some of the smaller ships still make use of water-cooled engines, with consequent frontal area. Despite the cross winds, Col. Turner won the Thompson trophy at an average speed of 241.051 miles an hour, as compared with Doolittle's 252.686.

With the same plane Turner made a dramatic futile effort to establish a new world's land plane record, but a combination of factors, including fog at one end of his course, beat him back to an average speed of 280 miles an hour.

The small planes, on the other hand, are getting smaller. Several which had appeared in former air races were even tinier. S. J. Wittman, of Oshkosh, Wis., flew his tiny ship, "Clipper," across the continent without altimeter or compass. But note: whereas the wing spread first was 20 feet, he remodeled the plane with a 17-foot wing, while the current model boasts a spread of only 14 ft., 6 in. Every year he "clips" two feet off the wing!

These babes of the air come in two classes, 375 cubic inch piston displacement and 550 inch displacement. They attain speeds up above 200 miles an hour. They land sometimes in excess of 100 miles an hour on wheels hardly larger than your hand. They buzz like bees in the air, yet the pilots "polished" the pylons so closely as they made vertical turns that the casual observer must have thought they'd collapse in the air.

As the planes flashed across start and finish lines, "two-eyed" cameras recorded their times and positions—within an accuracy of 1/1000 of a second and a fraction of an inch. These cameras have settled many disputes and have come to be a necessary part of judging finishes.

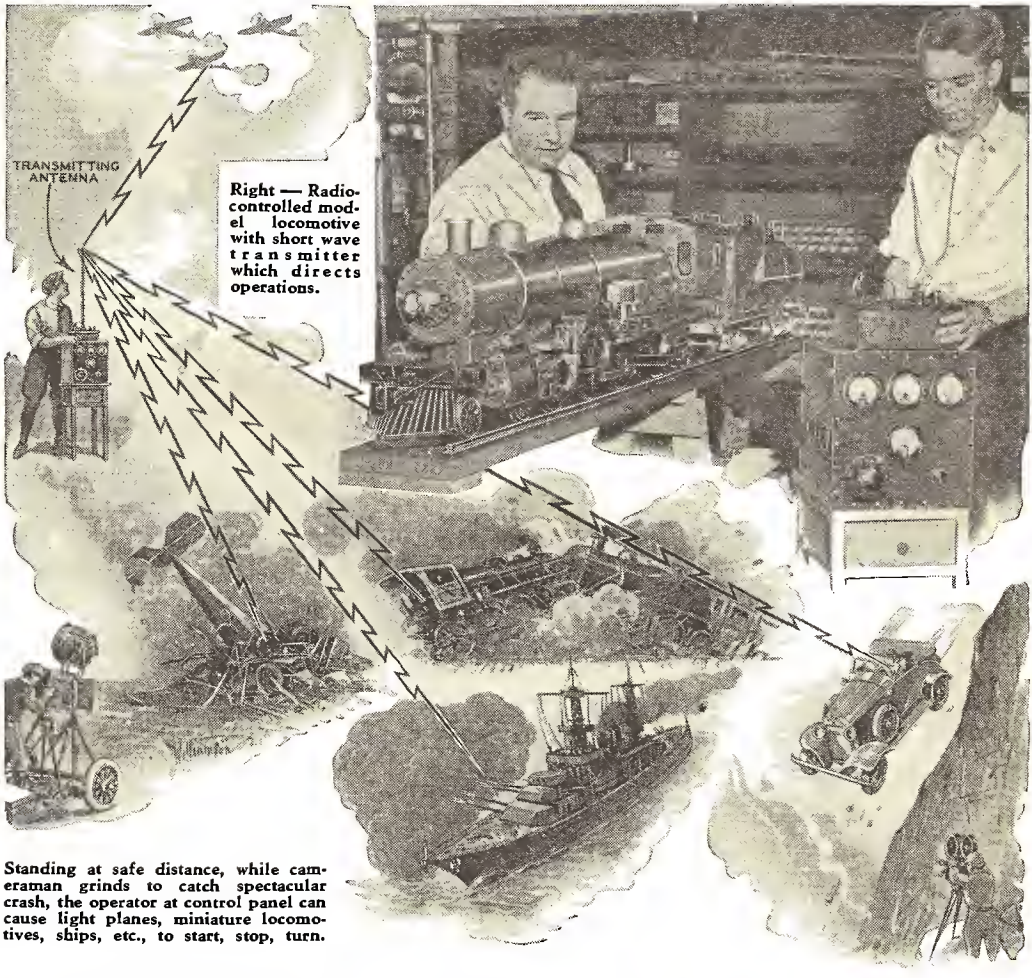
Advent of Low-wing Popularity

This year's races were marked by the almost total absence of biplanes and high-wing monoplanes. All the racers preferred low-wing ships, since they have been found more stable and easier to handle at high speeds. So well did they handle, in fact, that the four days of racing were completed without incident, excepting a "stunt" race between two motion picture actors flying fairly slow biplanes. "Hoot" Gibson plunged into the earth after a turn around a pylon because his experience was not adequate to permit him to carry the ship through quick maneuvers. He was not seriously hurt. Russell Boardman, who crashed in taking off at Indianapolis during the Bendix dash, died from his injuries.

But speaking of thrills—I must pay tribute

(Continued on page 27)

Robot Crashes Trains for Movie Thrills



Right — Radio-controlled model locomotive with short wave transmitter which directs operations.

Standing at safe distance, while cameraman grinds to catch spectacular crash, the operator at control panel can cause light planes, miniature locomotives, ships, etc., to start, stop, turn.

HOLLYWOOD stunt men who crash planes, boats, and automobiles to thrill you from the silver screen may soon be replaced by remote control radio apparatus which will put the aforementioned vehicles through spectacular crashes that no stunter would dare to attempt.

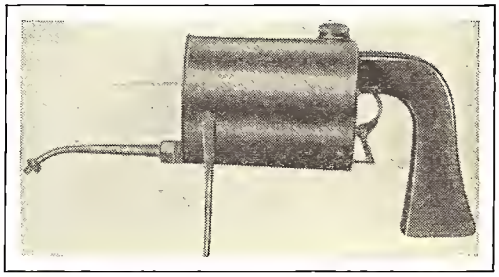
The apparatus which relieves stunt men of their perilous tasks is built in two units —one a low-power short-wave transmitter equipped with an impulse segregator and the other a super-sensitive receiver which picks up the radio signals and operates the control mechanism.

The operator standing at the keyboard of the transmitter can make a squad of light planes, a pair of automobiles or a squadron of miniature battleships stop, start, back up, turn to right or left.

Severe tests, in which the model train shown in the photo above was employed, indicate that movie goers will witness synthetic thrills startlingly life-like.

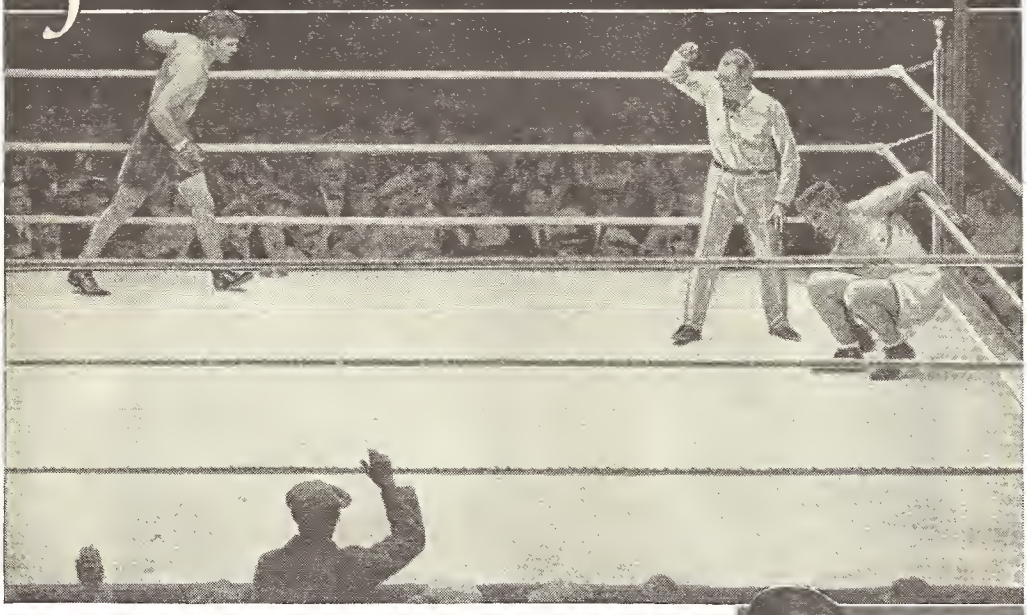
Oil Can Operates Like Pistol

YOU can shoot oil into bearings difficult of access with a new container that operates like a pistol. When your hand wraps around the handle, the fingers naturally contact the trigger, which, when pulled, causes a stream of oil to shoot from the spout.



Pulling trigger on can ejects stream of oil from the spout.

JACK DEMPSEY *on the*



The wounded Tunney crouches for the famous long count at Chicago; one of the two most dramatic moments in ring history. Down for fourteen seconds total time, Tunney retreated before the infuriated Dempsey, shown pacing out of a neutral corner, and won the Championship by running backwards the rest of the fight while an all-time record gate of $2,658,000 looked on. Judges allowed the fight to Tunney on his generalship. It marked one of the high points in Jack Dempsey's career as a blasting fighter and public idol.

JACK DEMPSEY, most colorful fighter the prize ring has ever seen, said to me the other day, "You can count on me to restore the $1,000,000 purse to the boxing world."

Ring science and mechanics have undergone amazing changes since the Manassa Mauler first started the climb to fame and fortune on the brakebeams of prairie freights nearly two decades ago, culminating in the million-dollar bonanzas which made him the best drawing-card of pugilism.

Today the still dynamic Jack Dempsey finds himself transformed from a million-dollar box-office attraction to a million-dollar promoter. He has hung up his gloves, he told me, and is devoting his talents to the emulation of the great Tex Rickard.

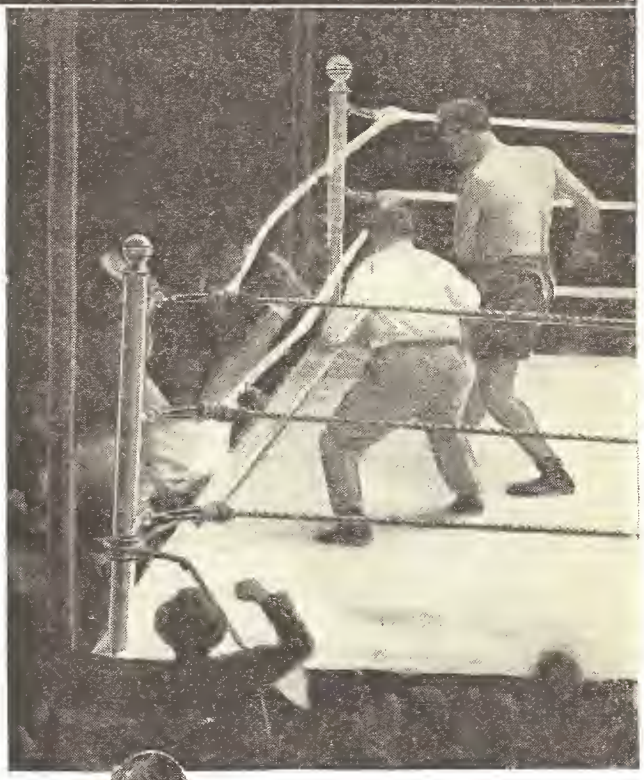
"You can't have million-dollar purses, of course," Dempsey said to me, "unless you've got fighters worth that coin." He was sitting at his desk in the offices of the Jack Dempsey Sporting Club, 1650 Broadway, New York City, where he is head man as the Manassa Promoter, as his cronies now call him.

"It's caliber that makes the million-dollar purse," the ex-warrior continued, "and the pugilist who can command that figure in this depression era has got to have what it takes. He's got to be the sum total, physically and scientifically, of all the boxers of olden

Jack Dempsey illustrates the famous Dempsey crouch, a method of "leading" which was a good offense because of its elusive defensive characteristics, making him hard to hit and placing him in near-position to shoot with either hand from any point. The right is drawn as for an uppercut; no "telegraphing."

MECHANICS of Boxing

The Manassa Mauler, now turned promoter, here tells Ben Lincoln some of the essential mechanics to be closely watched in the development of a real champion, adding illustrative excerpts from his colorful experiences.



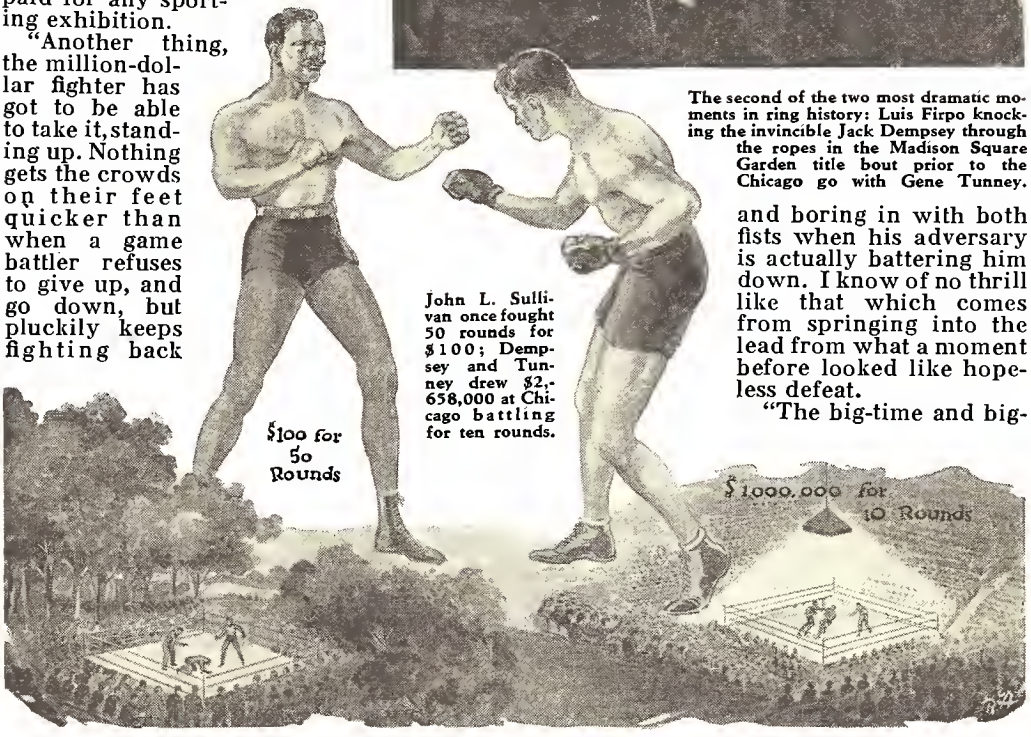
The second of the two most dramatic moments in ring history: Luis Firpo knocking the invincible Jack Dempsey through the ropes in the Madison Square Garden title bout prior to the Chicago go with Gene Tunney.

days, of the gold standard age.

"First and foremost, he's got to be a fighter. A real, ferocious fighter at heart. The so-called fussin'-around type does not go. They used to call me the Tiger, well, that's what he's got to be like. Action, that's what the customers crave. I gave them all the action I was capable of, down to the last gasping breath. It was that courage and the desire to give everything I had that made me the recipient of the first million-dollar purse ever paid to a boxer, the highest price ever paid for any sporting exhibition.

"Another thing, the million-dollar fighter has got to be able to take it, standing up. Nothing gets the crowds on their feet quicker than when a game battler refuses to give up, and go down, but pluckily keeps fighting back and boring in with both fists when his adversary is actually battering him down. I know of no thrill like that which comes from springing into the lead from what a moment before looked like hopeless defeat.

"The big-time and big-



John L. Sullivan once fought 50 rounds for $100; Dempsey and Tunney drew $2,658,000 at Chicago battling for ten rounds.

money fighter has got to have a sort of dramatic make-up. That's the best way I can explain it. People in show business call it personality. You don't exactly cultivate this. You're born to it. It's what they call inherent. This dramatic trait is what comes to the surface on the spur of the moment, instinctively. There's something heroic about it. It wins the hearts of the multitudes.

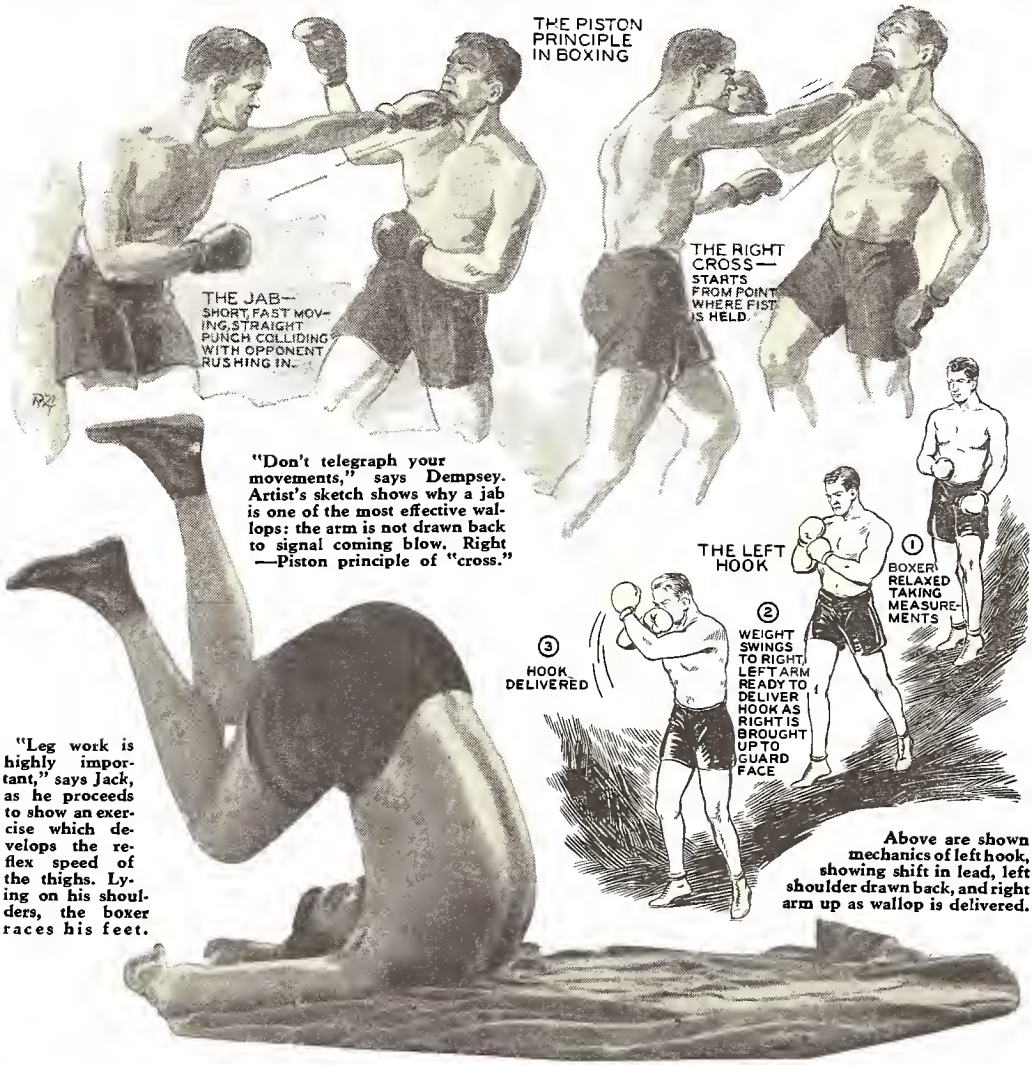
"For instance, the most dramatic moments I have ever experienced in the ring occurred on the evening of Sept. 14, 1923, at the Polo Grounds, New York City, in my bout with Luis Firpo, whose monicker was the Wild Bull of the Pampas, because of his Argentine origin.

"I knew very little about the Argentinian. One thing was apparent, he was a very huge and powerful fellow. I couldn't help grin just a little as he stepped from his corner at the crack of the gong, holding his right hand poised aloft, in the manner of 'telegraphing' its movements.

"Hardly had we warmed up with a few casual taps than the challenger brought down that right hand with a smashing trip-hammer blow. The sock jarred me. I was momentarily stunned, and quickly realized that this was no ordinary hombre.

"I'm sure no one knew I was startled by that first blow. I managed to retreat gently, and did a little bobbing and weaving, and then I sprang up swiftly, clipping him on the chin with a short left hook that carried plenty of business machinery with it. Down he went.

"He was up in three seconds and, acting instinctively, I let him have another left hook. I must have figured he was weak on that score and that since it worked once it was worth a second try. Firpo dropped


THE PISTON PRINCIPLE IN BOXING
THE JAB— SHORT, FAST MOVING STRAIGHT PUNCH COLLIDING WITH OPPONENT RUSHING IN.
THE RIGHT CROSS— STARTS FROM POINT WHERE FIST IS HELD.
THE LEFT HOOK
1 BOXER RELAXED TAKING MEASUREMENTS
2 WEIGHT SWINGS TO RIGHT, LEFT ARM READY TO DELIVER HOOK AS RIGHT IS BROUGHT UP TO GUARD FACE
3 HOOK DELIVERED

"Don't telegraph your movements," says Dempsey. Artist's sketch shows why a jab is one of the most effective wallops: the arm is not drawn back to signal coming blow. Right —Piston principle of "cross."

"Leg work is highly important," says Jack, as he proceeds to show an exercise which develops the reflex speed of the thighs. Lying on his shoulders, the boxer races his feet.

Above are shown mechanics of left hook, showing shift in lead, left shoulder drawn back, and right arm up as wallop is delivered.

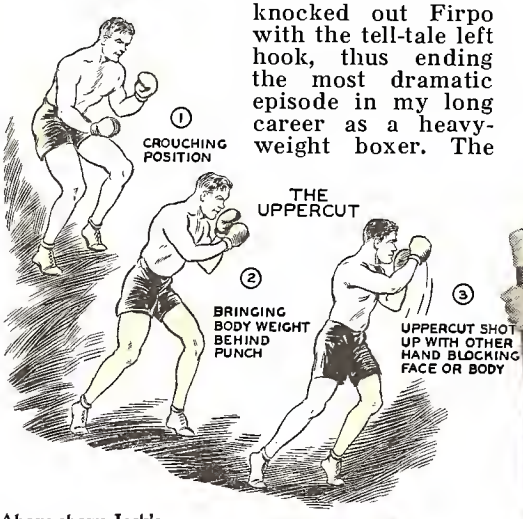
a second time. He was up, and the same punch sent him down. I don't know myself to this day how many times he was up and down, but I still can remember the sensations which shot through me when he rose and rushed at me.

"In those very brief moments he loomed far more infuriated and raging than any of the wild bulls of his native clime ever appeared. He made one last lunge at me, swinging his clumsy left, and I was half-knocked and half-pushed through the ropes, landing on the press-stand skirting the outside of the ring.

"I was pushed back into the ring by those nearby into whose midst I went sprawling. I remember the scene was one of wild pandemonium. I can still hear the deafening echoes, the cheers and yells of over 140,000 spectators.

"As I was about to strike up a fighting pose, Firpo was again on top of me, bent, no doubt, on polishing me off. But my timing was good. I caught him with another hook and he slipped to the mat. The gong clanged and the most spectacular round I ever fought was over. I might say that I am reasonably sure that it was the most startling three minutes that any fighter ever experienced.

"In 58 seconds of the second round I knocked out Firpo with the tell-tale left hook, thus ending the most dramatic episode in my long career as a heavyweight boxer. The gate for that fight was well over $1,000,000. My share was $470,000, or about $120,000 per fighting minute, a rate of compensation unknown to any other sport, or I might add, to any other scrapper.



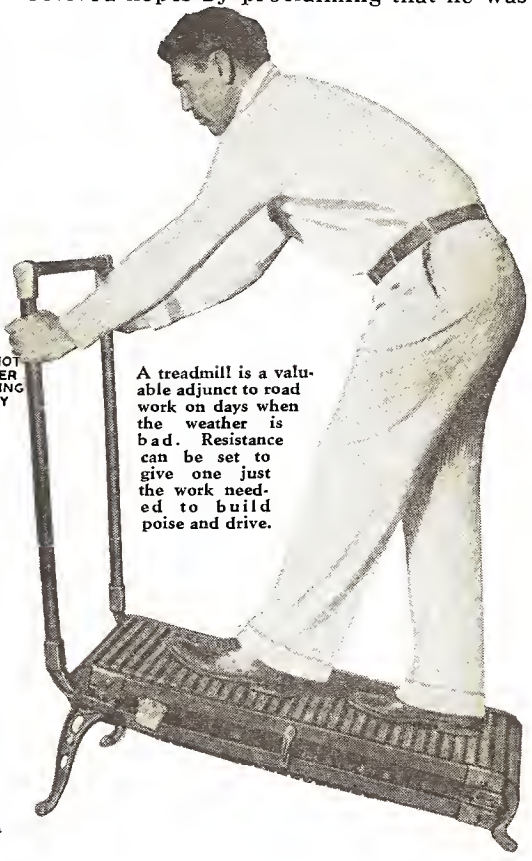
Above shows Jack's method of delivering an uppercut. The crouch is such that either a right or a left can be delivered within the flick of an eye. The hand is brought up with the weight of the body on the same leg, and the other hand is used to block. Part of Dempsey's ability to mow 'em down lay in his effectiveness in hitting in any position.

First Million Dollar Gate

"Tex Rickard as the nonpareil showman in the annals of sport was the creator of the million-dollar gate, so to speak. It was originated at Boyle's Thirty Acres in Jersey City where I fought Georges Carpentier, champion of Europe, on July 2, 1921. That fight drew $1,600,000 and it was the beginning of the Golden Age of sport."

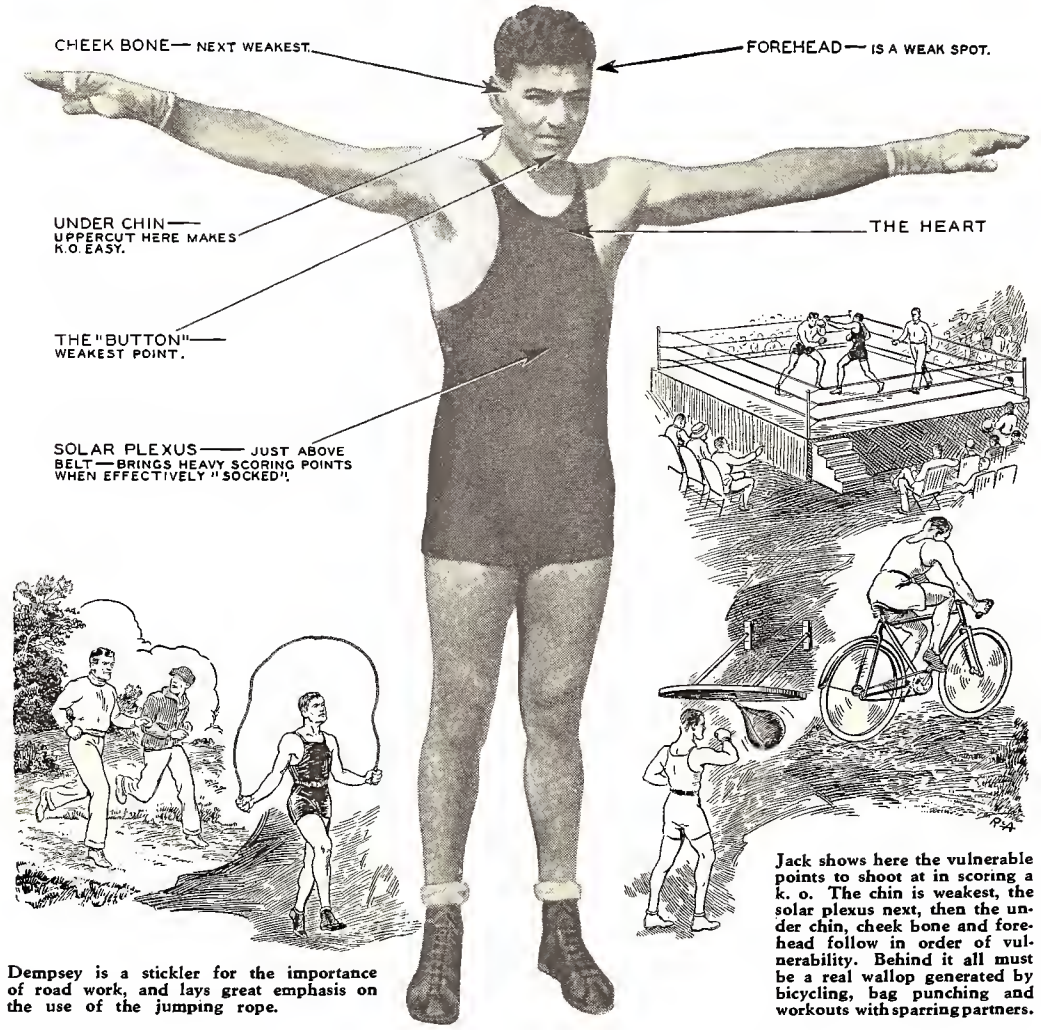
On Sept. 23, 1926, when Dempsey lost the title to Gene Tunney at the Sesquicentennial in Philadelphia, over 120,000 persons paid $1,895,000 in admissions. A year later prizefighting reached its golden peak in Chicago when the customers paid—again under the auspices of Tex Rickard—$2,658,000 to see Gene Tunney retain the title under Dempsey's onslaught, and also get the famous Chicago long count.

Almost simultaneous with the Wall Street debacle of 1929, boxing also hit a decided bearish trend. For almost four years thereafter the fight game seemed to be a lost profession and the big purse seemed doomed. Jack Dempsey came along last spring and revived hopes by proclaiming that he was



A treadmill is a valuable adjunct to road work on days when the weather is bad. Resistance can be set to give one just the work needed to build poise and drive.

Jack Dempsey Lists Vulnerable Points of Attack in Scoring a Knockout


CHEEK BONE— NEXT WEAKEST.
FOREHEAD— IS A WEAK SPOT.
UNDER CHIN— UPPERCUT HERE MAKES K.O. EASY.
THE HEART
THE "BUTTON"— WEAKEST POINT.
SOLAR PLEXUS— JUST ABOVE BELT—BRINGS HEAVY SCORING POINTS WHEN EFFECTIVELY "SOCKED".

Dempsey is a stickler for the importance of road work, and lays great emphasis on the use of the jumping rope.

Jack shows here the vulnerable points to shoot at in scoring a k. o. The chin is weakest, the solar plexus next, then the under chin, cheek bone and forehead follow in order of vulnerability. Behind it all must be a real wallop generated by bicycling, bag punching and workouts with sparring partners.

going to become a fight promoter and that his object was the return of the million-dollar gate and purse.

His first official act was to sign up Max Schmeling and Max Baer for an appearance in June at the Yankee Stadium in New York. At the time he was optimistic, forecasting that the bout would bring back the million-dollar gate. He predicted that the $1,000,000 purse would return this fall if he was successful in matching the winner of the Schmeling-Baer fight with Jack Sharkey, the heavyweight titleholder.

Thus we find the last cycle in the evolution of Jack Dempsey, the big business man of sportdom. He came from humble beginnings, without the luxuries and advantages which fall to lads with well-to-do parents. His father was a rover of Irish descent and his mother was Scotch-Irish. When he was in his early teens his impoverished family moved from West Virginia to Colorado where young Jack divided his time by working on a farm and in a mine.

"I got exactly sixteen bucks for my first fight," Jack told me, "and my second start brought me $25. Finally I got into the $500 class, and I certainly had to bowl over some mighty tough palookas to collect my cash. But it was all a great training-school for the future. I got on to the rudiments of the business early and it wasn't long before I knew I had a smart left hand, consisting of a triple-threat-jab, hook and uppercut.

"There's more to the boxing game than sheer, brute strength. It's the knowledge of how to use those primary elements which counts. You can take a man with a powerful right hand, but if he does not know the essentials of boxing science and mechanics, he's a hopeless dope when pitted against a much weaker antagonist who has mastered efficiency and effectiveness in

(Continued on page 137)

Bike Riding on Tight Wire Is Latest in Hollywood Fads

RIDING her bicycle along the popular beach at Venicc, California, near Hollywood was too tame a pastime for Billie Yuill, so with Isabclle Becker to help her maintain her balance she tricd out the stunt illustrated. Taking the tires off the wheels of her bike and with Isabelle in a rope swing underneath her "bike," she rode the lifeline along the beach.

This, as might seem at first glance, is not a new form of life saving conveyance, but a new beach sport in Venice, Cal.

What Weather Most Comfortable?

A TABLE of the kinds of summer and winter weather in which avcragc Americans should feel comfortable has been presented to the Franklin Institute, in Philadclphia. In winter, average people should feel comfortable at any temperature between 63 degrees and 71 degrees and when the relative humidity of the air is between 30 per cent and 70 per cent.

In summer, the accepted comfort zone moves to higher temperatures, including any temperature between 66 degrees and 75 dcgrecs. The comfortable range of relative humidity in summer remains the same as in winter, between 30 and 70 per cent.

"Pressing" a Lot Into a Little Space

Here is a masterpiece of model-making—miniature printing press that looks suited to turning out pocket editions!

ABOVE is seen a project that should be dear to the heart of a dyed-in-the-wool model maker. It took some real designing, to say nothing of the most painstaking construction to "press" this real flat-bed Webb printing press into such small dimensions. This press, which is said to be the smallest of its kind in thc world, contains every feature and device of the regular size presses of which it is a counter-part, and is an outstandingly interesting exhibit of the "Century of Progress" Exposition at Chicago. Miss Irene Donnelly is shown about to start the press on its production run.

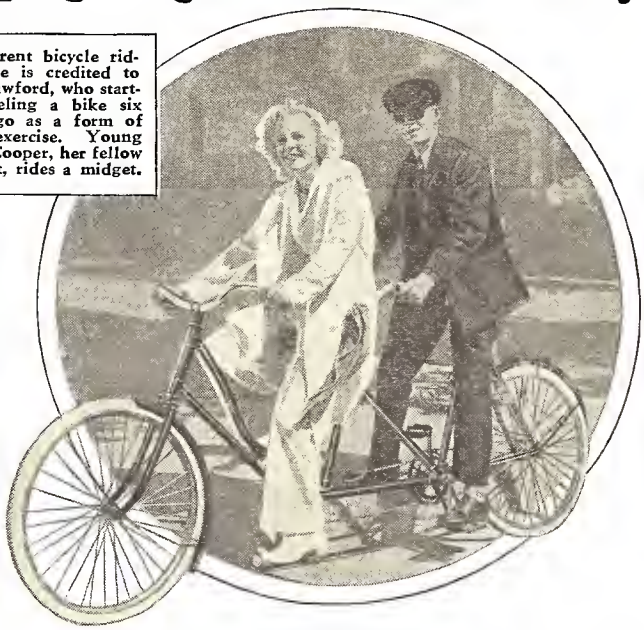
New Trunk Wheels on Turntable

LAST word in convenience is represented in a new trunk which does not need a couple piano movers to juggle it into position! The new design is fitted with a turntable bottom. A light push will whirl it around so that any of its compartments can be easily and quickly reached. Five metal feet on the disc or turntable elevate thc trunk slightly off the floor and prevent the stationary part of the bottom from touching floor when trunk is revolved. This trunk may be confined in corner of a Pullman.

To save wear and tear on disposition of user, this trunk is conveniently mounted on a turntable for accessibility.

Bike Craze Raging--Rentals Make Money

The current bicycle riding craze is credited to Joan Crawford, who started wheeling a bike six years ago as a form of daily exercise. Young Jackie Cooper, her fellow star, left, rides a midget.



Hollywood, having started the nationwide craze for bicycle riding as a form of exercise, outdoes itself when Lyda Roberti, of Paramount, lets her chauffeur do part of the work on a bicycle built for two, as shown in photo above.

Even Grandma gets the fever again, and trots out grandad's old angel maker. This bike is the immediate forerunner of the modern chain drive, two wheel "safety" bicycle. As against the old high wheeler with direct pedal drive, this bike is quite an improvement, what with treadle and all. The modern lass has taken to wearing pants, and modern bikes are built to fit her, with cut away frames.

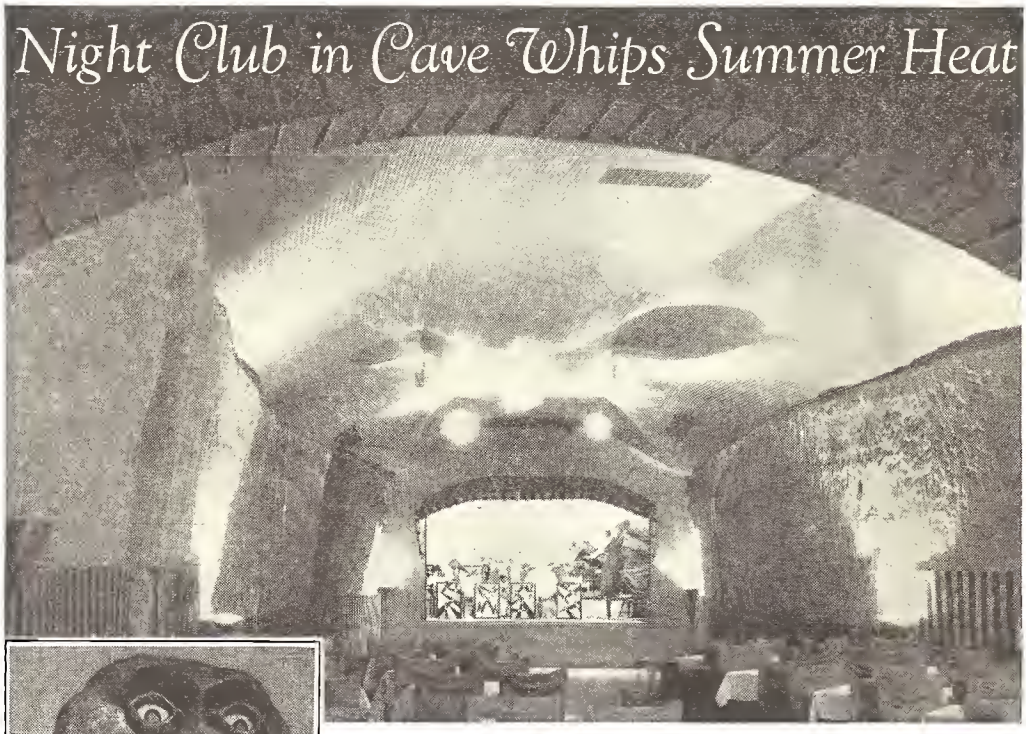
CREDITED to comely Miss Joan Crawford who started daily bike riding six years ago as a method of keeping physically fit, the bike riding fad has swept to all corners of the nation. Bicycle makers rub their hands with gusto, wink at the Depression, and continue to sell great quantities of wheels at around twenty dollars per machine.

No little part of the present craze is due to the improvement in bicycles, which now ride smoothly, have cut-away frames and chain guards for skirts.

Balloon tires, brakes on both wheels, super comfortable seats and silent chains are improvements which the present day bicycle rider demands. A large part of the faddists are women and it has been said by a number of prominent physicians that the riding of a bicycle develops shapely legs and reduces a flabby torso in a way no other form of exercise can do. Which possibly accounts for the popularity of the sport among women.

Many concessionnaires, always alert to profit, are setting up stands where bicycles may be rented. From Los Angeles to Boston in all major cities wheels can be rented at 25c per hour, and many operators have rented a dozen bikes in such a way that their original investment has been returned in a week. Far from dying out quickly as did the Miniature Golf Course idea, bike riding is taking hold more and more strongly; one devotee tells another, makes up a party, and it's a poor location that can't make money with a bike stand these days.

Night Club in Cave Whips Summer Heat



Above—Interior view of the "Mystic Caverns," of St. Paul, where revelers disport themselves beneath 150 feet of solid sand rock, in a temperature of 48 degrees plus 8 degrees of artificial heat. Left—The entrance to the subterranean chambers—a huge gorilla mouth at the base of a towering sandstone cliff bordering the Mississippi river. Right—The bar, a favorite rendezvous.

ST. PAUL, Minnesota, boasts a new night club said to be without equal anywhere in the world for novelty and comfort during torrid summer months. Called the "Mystic Caverns," the club occupies a labyrinth of caves which form a natural refrigerator with a year round temperature of 48 degrees.

The subterranean chambers where the revelers disport themselves have their opening in the face of a towering sandstone cliff bordering the Mississippi. Once you step inside you are literally in the bowels of the earth, with solid sandstone walls all around you and 150 feet of solid sandrock overhead.

About eight degrees of heat make the atmosphere decidedly comfortable inside the caverns when the mercury is flirting with the hundred mark outdoors. In winter, 20 degrees of furnace heat convert the labyrinthine chambers into a cozy beer hall.

Oiling Saws Kept in Damp Places

TO preserve your saw against rust slip it through a slot cut in a 1x2 lined with an oiled fabric, as shown in the photo. A few slides after using will keep the metal well greased. The 1x2 can be mounted conveniently overhead. Canvas will suffice for cloth.

Saw is slipped back and forth between oiled fabric after using.

New Device Feeds Golf Balls to Tee for Practice Driving

The advantages of this device are evident. The driver need not exert himself leaning over to tee each golf ball; he can drive a greater number of balls in a given length of time. Inset shows the spiral down which the balls travel to tee.

A PORTABLE, automatic ball teeing device now available for golfing addicts, feeds the balls, one at a time, from a spiral magazine to a rubber tee, from which the player drives it. By the time the player has watched the first ball to its landing place the machine has accurately placed a second ball on the tee.

The machine shown in the picture holds fifty balls but any number less will operate as well, and an extension to the magazine of the machine would permit any additional number. The mechanism of the device consists of a magazine trigger lever and a feed lever and weight delivery trough—all controlled by the weight of each successive golf ball as shot or driven and without the use of springs or gears.

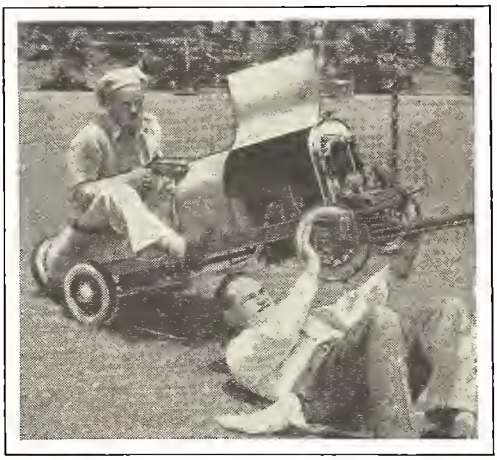
Fore! and up to 50 at One Stance

LAKE Merritt, Oakland, California, Breakfast Club members are practising for their first "Aquatic Golf" tournament to be held on the lake.

Six teams will be entered in the contest, each team consisting of one golfer who will "tee off" from a specially constructed raft, and a boat manned by four oarsmen to act as "Greens Committee" and caddies. Regulation golf clubs and balls will be used but bathing suits will be worn! W. A. Davis, club president, is shown ready to try a shot from a raft out into the lake, while Madelon Sivyer, club mascot, looks on.

"Aquatic Golf"—every hole a water hazard—no sand traps!

Vest Pocket Auto—Almost!



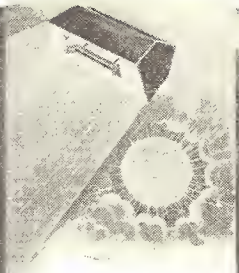
Helping hands give midget automobile a lift after Vince Barnett, movie star, gives amazing demonstration proving his car can burn up Hollywood on a quart of gasoline.

HERE is illustrated Vince Barnett seated at the wheel of his diminutive Muller Special, a single cylinder automobile that can be driven through Hollywood on one quart of gasoline. Barnett must be having some "heavy" mechanical trouble as he sits "in the driver's seat" while being "held-up" on one of his trips—with his car being jacked up in preparation for a tow in to the nearest garage.

Greatest Mountains Never Seen

THE world's greatest mountain range is one of which no man has seen anything except a few of its topmost peaks. Almost the whole enormous mountain chain is under water. It is what oceanographers call the Mid-Atlantic Rise, about halfway between South America and Africa and stretching northward to Iceland and southward to the Antarctic continent. The Azores islands are a few peaks of this range tall enough to reach out through the water.

Ultra-Violet Rays Shift Picture SCENES



Startling display at Chicago Fair is painting which changes scene right before your eyes. At right is seen how the picture looks under ordinary daylight, while at left is the picture when the ultra-violet rays are switched on. Strobilite colors, which fluoresce under ultra-violet rays, are painted over picture at the left.

ON DISPLAY at the Chicago Century of Progress Fair is a painting which mysteriously changes its scenery in the space of an eye-blink. That is, it's mysterious until you learn that ultra-violet rays are being played on the canvas. A new kind of coloring substance makes it possible to have two paintings in one. Invisible under ordinary light, these Strobilite colors, as the pigments are called, may be applied to any painting without changing its appearance.

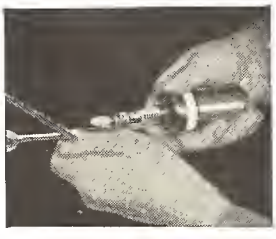
In darkness, however, when subjected to ultra-violet rays, the scene changes because only the Strobilite colors then become visible—a result of their peculiar quality of fluorescence under these conditions.

Under ordinary lighting the painting shows a picture of children at play beside a lake, but when the lights are turned out and the painting is subjected to ultra-violet rays, the children are shown in a play room under a sun lamp.

Handiest Grinder for Workshop

EXTREMELY handy for small grinding jobs in the workshop is a diminutive grinder which proves ideal for getting into tight, awkward places.

The motor is contained within the handle, as may be seen in the drawing at left. The grinding wheel provided is conical in shape and proves the most adaptable for general work. Other shapes are available for other types of work, however. Careful balancing permits the most delicate work.



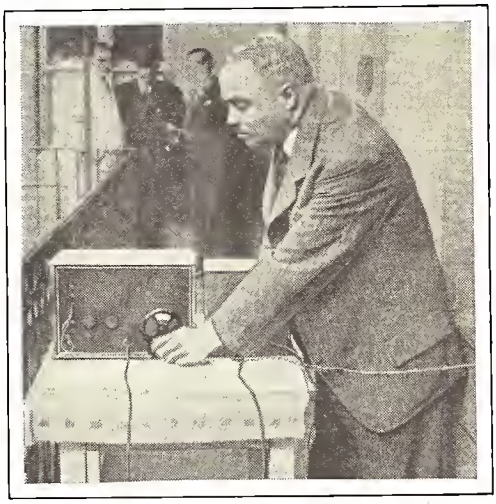
Midget grinder has motor in handle. Ideal for small work.

Cheap Radio From the Power Line

THERE is a promise of a serious threat to the radio industry represented in a new type radio receiver which, the inventor claims, will eliminate ordinary broadcast receivers altogether.

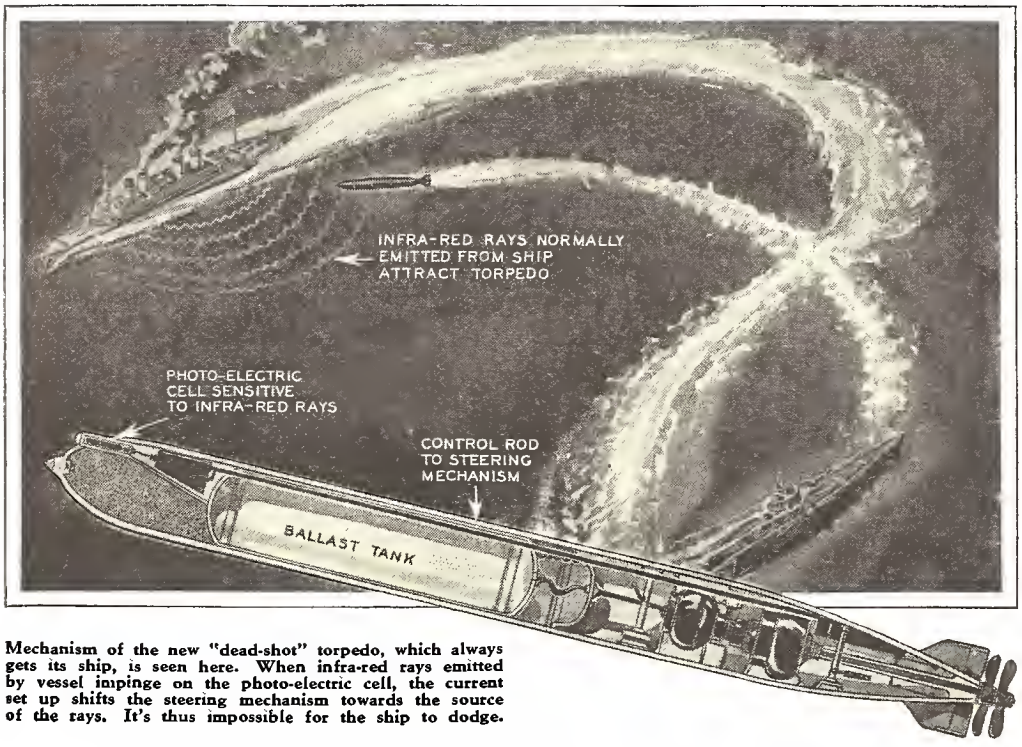
"Futophone" is the name of the instrument, and it is claimed that with it anyone can tune in any local or long distance broadcast by simply plugging into the electric light line.

The heart of the device is a special microphone taking its juice and signals from the power line. Programs from any station you want roar forth when you insert a coin in a slot.



Inventor operating his "Futophone" which consists of a microphone that plugs into ordinary electric light line. Coin-in-slot brings in local and long distance programs.

World's Deadliest Weapons


INFRA-RED RAYS NORMALLY EMITTED FROM SHIP ATTRACT TORPEDO
PHOTO-ELECTRIC CELL SENSITIVE TO INFRA-RED RAYS
CONTROL ROD TO STEERING MECHANISM
BALLAST TANK

Mechanism of the new "dead-shot" torpedo, which always gets its ship, is seen here. When infra-red rays emitted by vessel impinge on the photo-electric cell, the current set up shifts the steering mechanism towards the source of the rays. It's thus impossible for the ship to dodge.

While peace parleys convene, only to end in failure and increased hatreds, military inventors smile to themselves and go on perfecting their engines of death. This article sets forth advanced data on these new weapons and tells how they will add deadliness to combat when they appear at the Front in next war.

by **RUSSELL J. MORT**

FROM the bow of a submarine lurking submerged in the offing shoots a torpedo bound on a mission of destruction. Leaving a streaked wake as it cleaves the water, it speeds straight for the hull of an unwary destroyer cruising across the horizon.

In the crow's nest of the destroyer, the lookout scanning the sea's surface for any sign of an enemy, picks up the white foaming line whose point is tearing towards his vessel. Without a moment's hesitation he shouts the ominous warning into the speaking tube leading to the bridge: "Torpedo off the starboard beam!"

Hard A'port to Avoid Torpedo

With cool haste the destroyer's commander signals the helmsman to put the wheel hard a'port. Then while the long, deadly torpedo dashes ahead, the lean, gray destroyer swings sharply to the left, and the commander breathes a sigh of relief, for he believes he has maneuvered around in time to get out of the path of the onrushing missile.

But suddenly and unaccountably the torpedo alters its course, too, and makes a bee-line straight for the destroyer's hull. The ship's commander is bewildered at these strange antics. Again he signals hard a'port. The vessel swings around again, and again the torpedo, now only a hundred yards off, changes its course—straight toward the war dog's hull.

No Escape

The commander shouts orders for the third swing to port, but it's too late. The torpedo dashes against the destroyer's side and there is an ear-splitting detonation. Like some inescapable undersea Nemesis, the submarine's missile has hunted down its victim and sent it to the bottom of the sea.

Thus may naval encounters of the fu-

ture result, thanks to the development of a new type of torpedo which will literally chase its victim around the ocean till it finds its mark.

Complete details of the amazing torpedo are veiled in secrecy. However, sufficient information has been relcased by its inventors to give a fairly clear idea as to the operation of its mechanical steering brain.

Infra-red Rays Steer Torpedo

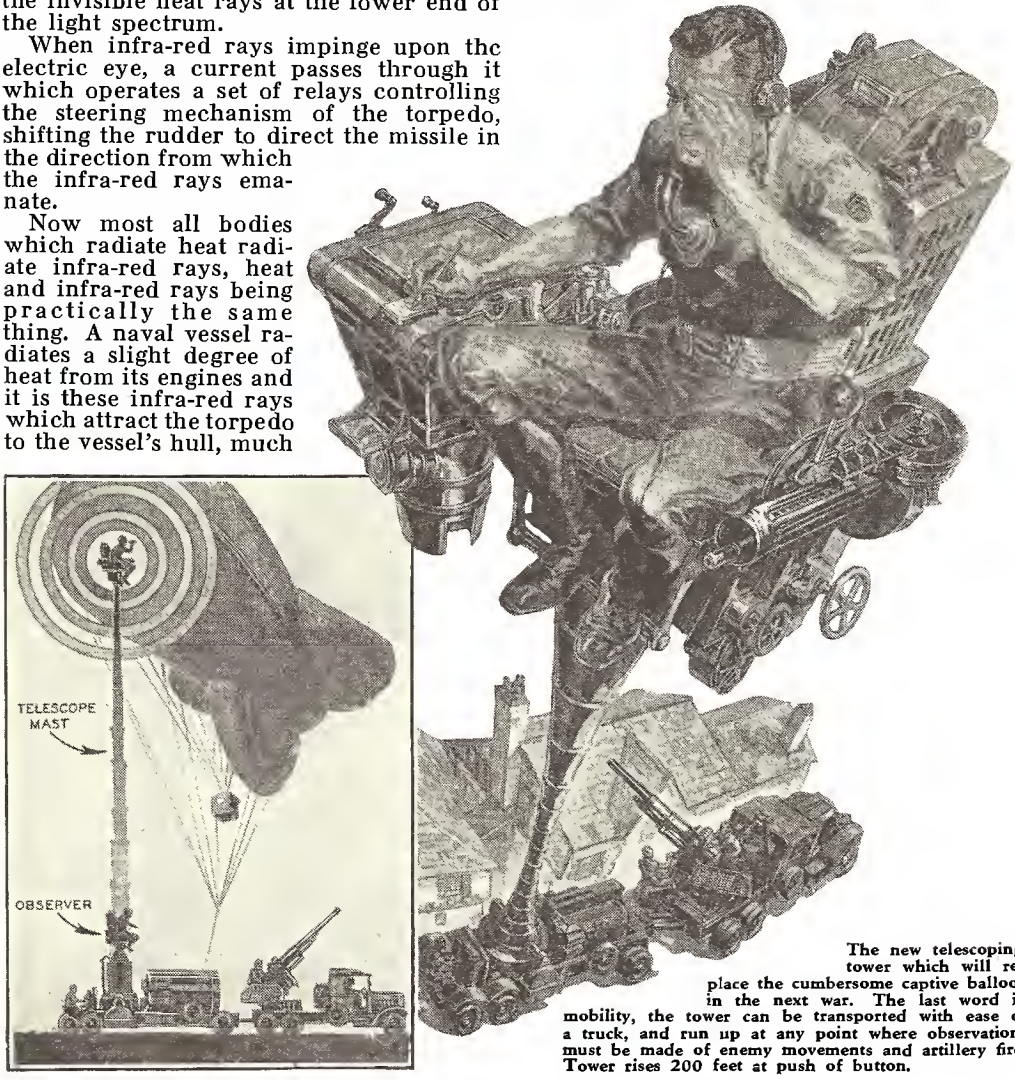
The secret of the steering mechanism lies in the electric eye built into the nose, just beside the detonating cap, as illustrated in an accompanying drawing. Special filters mounted in front of the "eye" screen out all but infra-red rays, that is, the invisible heat rays at the lower end of the light spectrum.

When infra-red rays impinge upon thc electric eye, a current passes through it which operates a set of relays controlling the steering mechanism of the torpedo, shifting the rudder to direct the missile in the direction from which the infra-red rays emanate.

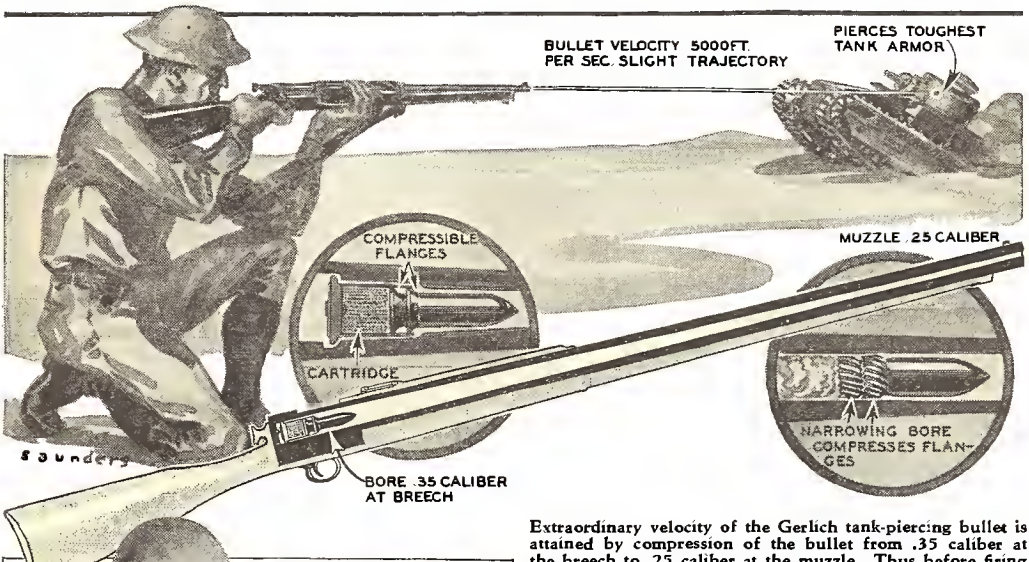
Now most all bodies which radiate heat radiate infra-red rays, heat and infra-red rays being practically the same thing. A naval vessel radiates a slight degree of heat from its engines and it is these infra-red rays which attract the torpedo to the vessel's hull, much as a magnet attracts a piece of steel. No matter what maneuvers the ship may go through, the torpedo, speeding towards the source of the infra-red rays, will always strike its target.

Onc of a number of new instruments of war, the invention of this new engine of death points out a distinct trend in the development of weapons for future wars. There is much wild talk among laymen in military matters about weapons so hideous that in battles in the next war whole regiments will be annihilated in the batting of an eye.

Thorough research on the part of Modern Mechanix and Inventions correspondents, however, indicates that military in-



The new telescoping tower which will replace the cumbersome captive balloon in the next war. The last word in mobility, the tower can be transported with ease of a truck, and run up at any point where observations must be made of enemy movements and artillery fire. Tower rises 200 feet at push of button.



Extraordinary velocity of the Gerlich tank-piercing bullet is attained by compression of the bullet from .35 caliber at the breech to .25 caliber at the muzzle. Thus before firing the bullet has a large cross-sectional area to take full force of the explosion, and after firing has a small area to reduce wind resistance to minimum. Drawings show compression.

Army is cutting expenses at target practice by using recently invented midget cannon which has same firing characteristics as its more violent brothers. Projectile is small steel ball held in the hand of Capt. George Mason, the inventor.

ventors are devoting their energies more to perfecting weapons which have already proven their practicability and deadliness in the clash of battle, rather than to fantastic schemes for wholesale destruction of enemy forces. The World War was responsible for many hastily-contrived weapons, but it also pointed out the weaknesses of these weapons. Inventors are profiting by the lessons the war taught.

One lesson had to do with the vulnerability of the captive observation balloon. Floating like gigantic sausages in the air, they were fair game for any enemy plane that chose to attack. A stream of incandescent bullets sent them flaming to earth in a cloud of smoke.

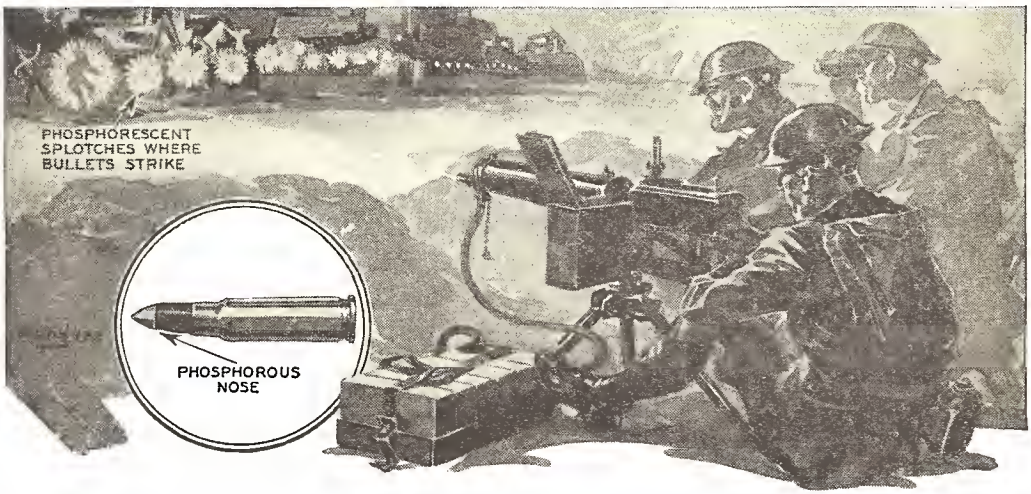
Inventors have now relegated these massive bags of inflammable gas to the limbo occupied by the catapult and the battering ram. Their positions behind the lines in the next war will be occupied by the jumping-jack observation tower shown in an accompanying drawing. From the vantage point of his perch atop the telescoping tower, the observer will scan the battlefield to report enemy movements and effects of artillery fire, while a ground crew holds itself in readiness to lower the mast the moment an enemy plane shows itself in the skies.

Ready for Action on Moment's Notice

There will be much less danger of an attack, however, because the tower, tall and slender, will not bulk so huge against the sky as the old-fashioned observation balloon used in the World War. Other large advantages are represented in the extreme mobility of the tower, since it can be lowered and raised in a few minutes, and transported to some vital battle area as fast as an auto can move.

A weapon to combat the formidable tank was another problem that confronted military men during the World War, and it was not until very recently that a satisfactory solution was found. This solution is a high-velocity bullet which drives right through the toughest tank armor—a solution, too, which bears out the military

Radium-nosed Bullet Shows Night Machine Gunner What He's Hitting



New phosphorous-nosed bullet developed by the English creates a luminescent splotch wherever it strikes, enabling machine gunners to see where they're firing when peppering suspicious objects at night. Range can be determined from luminous dots.

commonplace that for every weapon of offense there is a weapon of defense.

An invention of H. Gerlich, a German ballistics expert, the bullet is now under investigation by small-arms technicians of the American Army.

The secret of the extraordinary armor-piercing power of the new bullet lies in its "compressibility." The projectile goes in at the breech at .35 caliber and comes out the nozzle .25 caliber. This compression is effected by tapering the bore as illustrated in an accompanying drawing.

The projectile is equipped with two flanges, .35 caliber in diameter which slip into the ammunition chamber of the rifle, whose bore is channeled to fold down the

(Continued on page 26)

Tube Plants Seeds One at a Time

THE difficult job of handling small seeds while planting them is made easy with a pointed glass tube through which the seeds are shaken into the ground. The entire packet of seeds is emptied into the tube. They will not run out freely, a slight shake being necessary to make the seeds enter the stem.

With the row marked out in the soil the planter is taken in the right hand in the manner of a pencil and then given a quick jerking movement over the row. One seed falls out at a time. This process is continued along the entire row. Three different sizes are available for various types of seeds.

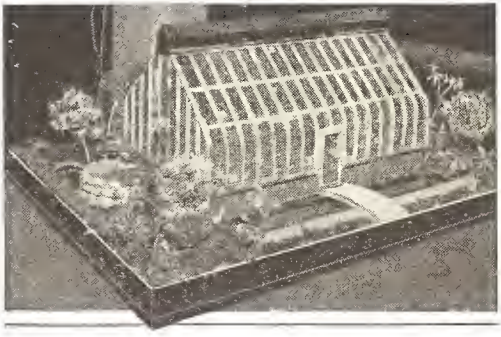
Seed is shaken down into tip and injected into the ground. One tube holds entire packet.

A cork in the top keeps seeds from running over during the shaking procedure. Ideal for flower planting, small gardens.

Ornamental Table-top Greenhouse

FIRST prize for the last word in uniqueness in the way of home ornaments goes to a table-top greenhouse built by a Boston workshop fan. Shown below, the house measures one by two feet and contains a stand of small evergreen trees, along with other small decorative plants. A rock garden, a sunken pool, and a miniature bridge add to the attractiveness of the layout.

Greenhouse and pools are lighted by electricity, and special mechanical means are employed to maintain correct temperature and water level in the pool.



Striking ornament for the living room is this indoor greenhouse, having copper frame and celluloid windows, and surrounded by sunken pool containing tropical "goldfish."

Gas Captures Gangsters Without Bloodshed

Injection of asphyxiating gas by a policeman shielded by bullet proof screen renders gangsters unconscious in short order.

How gas is fed into the room where crooks are holding out against capture. Besieger is opening valve from gas tank, being protected by a mask.

Paris police are shown hauling out gangster overcome by gas.

Invention of Chicago man, tear gas gun, in circle, discharges when plate before safe is stepped on by cracksman, completing electric circuit and sending police alarm. Blinded victim is easily captured and jailed.

GAS bids fair to replace bullets in bringing criminals to justice.

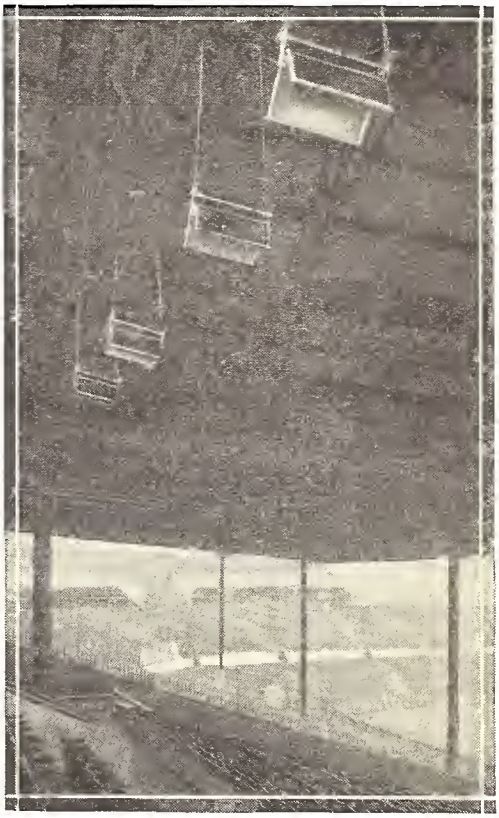
Experiments conducted recently by the French Gas Brigade proved that an injection of gas into an underworld hideout renders the victims helpless in short order and, more important, avoids loss of life.

The procedure of capture is illustrated above. Policemen bent on compelling a surrender approach the door of the hideout behind a bullet proof shield, meanwhile calling upon the felons to come out.

Upon refusal the besiegers bore a hole in the door, slipping the bit through an opening in the shield, insert the pipe from a tank of asphyxiating gas, and open the valve. Shortly a series of gasps are heard followed by the thuds of falling bodies. All that is left then for the police is to haul the unconscious bodies off to jail.

Electrically Heated Grandstand for Winter Football Games

AN INTERESTING experiment is being made in England in the grandstand of the Manchester United Football Club. A section of the stand containing about fifty seats is given over to four 2½ K. W. high temperature radiant electric heaters placed about ten feet above the heads of the seated spectators. The field of heat from these units radiates over this entire section, which is thus flood-heated. It is said that the comfort of the spectators has been considerably enhanced. The first cost of the installation is high but the operating cost is low because heat is required for but short periods.



"Flood-heating" a grandstand without any attempt to warm or move the air is done by electric radiators overhead.

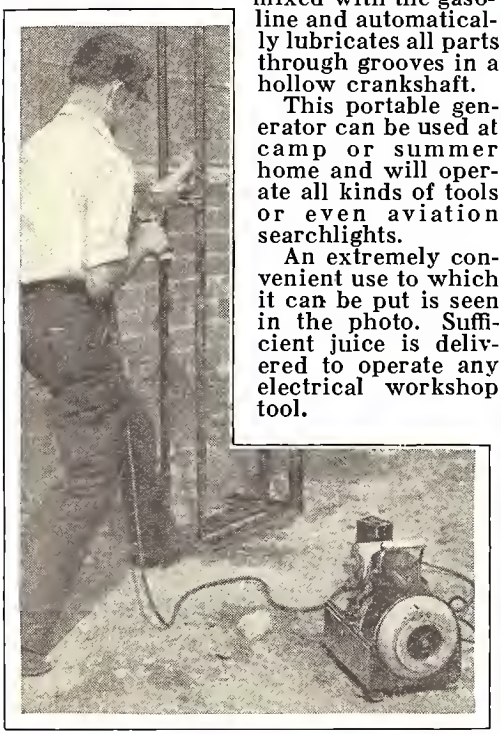
Portable Power Plant for Odd Jobs

A NEW portable generator, almost small enough to put in your pocket, weighs only 35 pounds, stands about one foot high, yet is capable of generating enough electricity to run a ¼ H. P. motor or to light ten 40-watt bulbs. A small one-cylinder air-cooled gasoline engine runs the generator, and both of these are combined into a single unit with the gasoline tank logically confined within the base.

No technical training or experience is required to operate it; it is quickly started by giving a sharp jerk on a cord wound around the end of the exposed flywheel. Then the tool or appliance to be run is simply plugged in. It will run for three to five hours on one gallon of gasoline; oil is mixed with the gasoline and automatically lubricates all parts through grooves in a hollow crankshaft.

This portable generator can be used at camp or summer home and will operate all kinds of tools or even aviation searchlights.

An extremely convenient use to which it can be put is seen in the photo. Sufficient juice is delivered to operate any electrical workshop tool.



Portable generator operates electric tools and electric household appliances where commercial power lines are lacking.

"Heavy Duty" Pencil Sharpener

THERE is probably no device, in shop or office, that gets more use and abuse and yet less attention than the well-known pencil sharpener. It is used by everybody and cleaned out by nobody! It is very easy for one machine to become so clogged up that it is impossible to sharpen a pencil without breaking it. Here is a solution arrived at by taking a biscuit tin and mounting it directly under the sharpener instead of the little container furnished. Such a box will go for several weeks without need of emptying. It is a practical arrangement where there are many users.

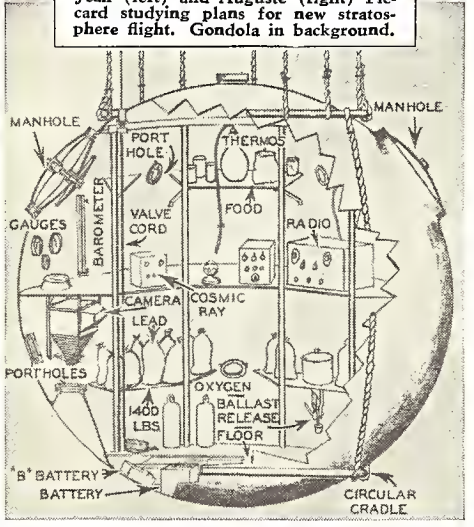
Pencil sharpening set-up as shown seldom needs emptying.

FLYING with PICCARD

Behind the newspaper headlines relating the progress of Prof. Piccard's stratosphere flight lies this fascinating story of the scientific details of the amazing aeronautical adventure.

WHEN the Piccards take to the stratosphere in search of new data on the behavior of the mysterious cosmic rays emanating from interstellar space, the pulse of the whole civilized world beats a little faster. The imaginations of millions of people are aroused to new heights by the thought of a pair of scientific adventurers penetrating the icy reaches of outer space, there to wrest from the universe a few more of its stubborn secrets.

Jean (left) and Auguste (right) Piccard studying plans for new stratosphere flight. Gondola in background.



Sketch of the interior of the latest Piccard stratosphere gondola shows arrangement of the various instruments. Fliers ride on "roof-garden" on top of cabin when near earth.

To the awe-stricken public following in the newspapers the trail of the stratosphere navigators, the flight is an amazing adventure into the heavens. Behind the scenes, however, lies another adventure which will elicit the keenest interest for MODERN MECHANIX AND INVENTIONS readers.

The extensive preparations made for the flight, the intricate calculations involved in floating the great gas bag up into space, the unusual construction of the stratosphere gondola, and the way the intrepid space navigators live during their journey through the void—all these details make a fascinating story within a story.

Filling the huge balloon in preparation for the ascent is a spectacle. Into an appendix-like arrangement at the bottom of the bag—a small tube several feet in diameter—is fed 125,000 cubic feet of hydrogen 99½ per cent pure. At first lying flat on the ground like an unhoisted circus tent, the giant envelope begins to rise in the middle like a bubble, then, as gas is fed in, it assumes the shape of a fantastic mushroom growing at a startling rate in the cool of the evening of the ascension.

When completely inflated for the take-off, balloon is an elongated, flabby, billowing bag only 25 per cent filled with hydrogen. This strange sight, which makes unscientific onlookers wonder how such a thing could ever get off the ground, is due to the necessity for expansion as the balloon rises into the rarified atmosphere, where, at 11 miles altitude, it attains complete distension.

While the ground crew hangs onto the array of ropes depending from the envelope, the stratosphere fliers climb into the cabin through the two manholes on the sides. The globe-shaped cabin is seven feet in diameter and rests in a ring-shaped cradle.

In deference to scientific laws, the top of the cabin is painted white, the bottom black. At extreme altitudes the gondola's white top will reflect the intense rays of the sun, and thus avoid overheating of the occupants. The black portion absorbs sufficient heat from the earth to keep the fliers comfortably warm when the temperatures are dropping to 75 below zero.

Leakage of air from the sealed gondola at 10 or 11 miles above the earth would be fatal to the scientists, so care has been taken

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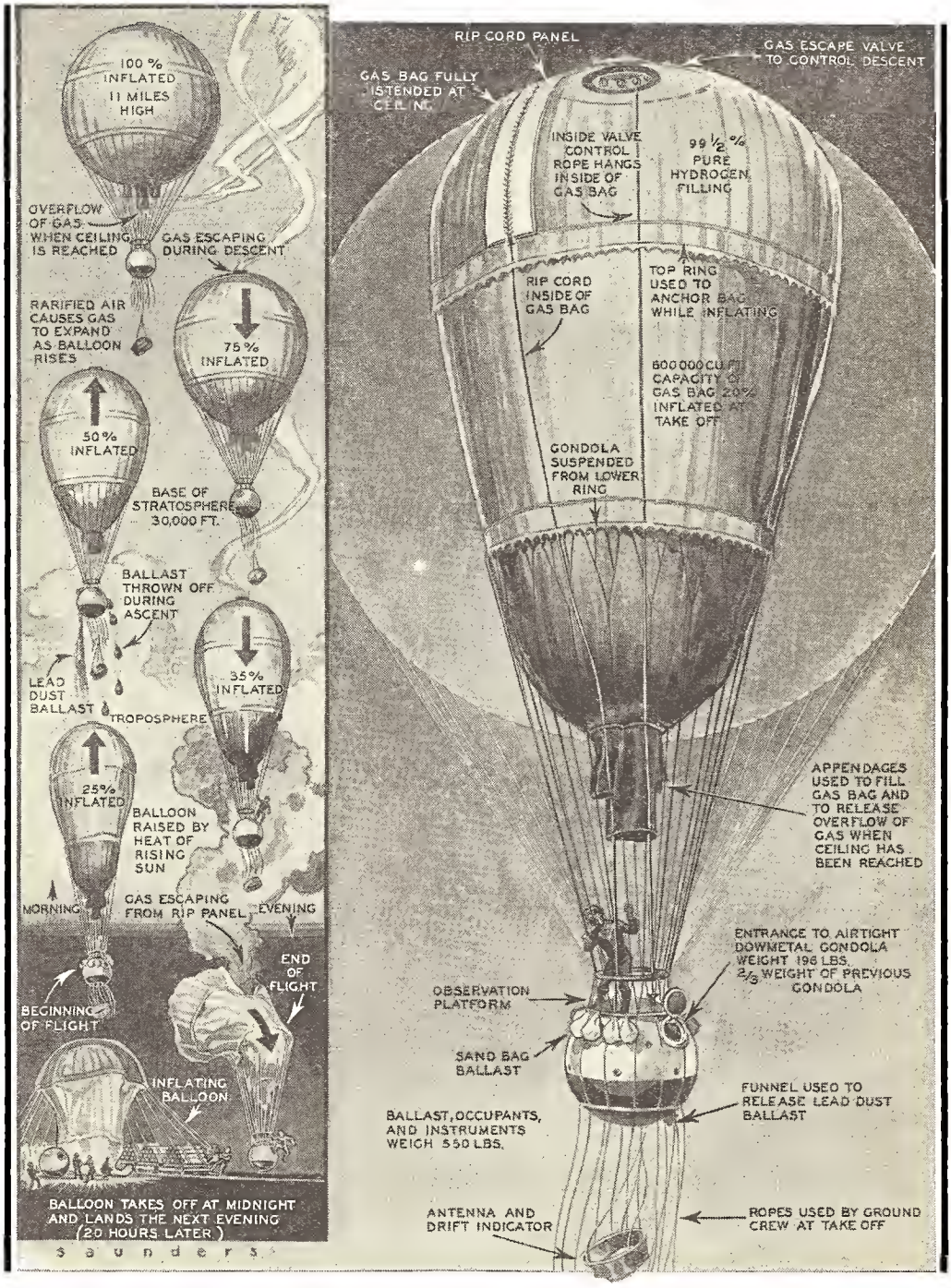
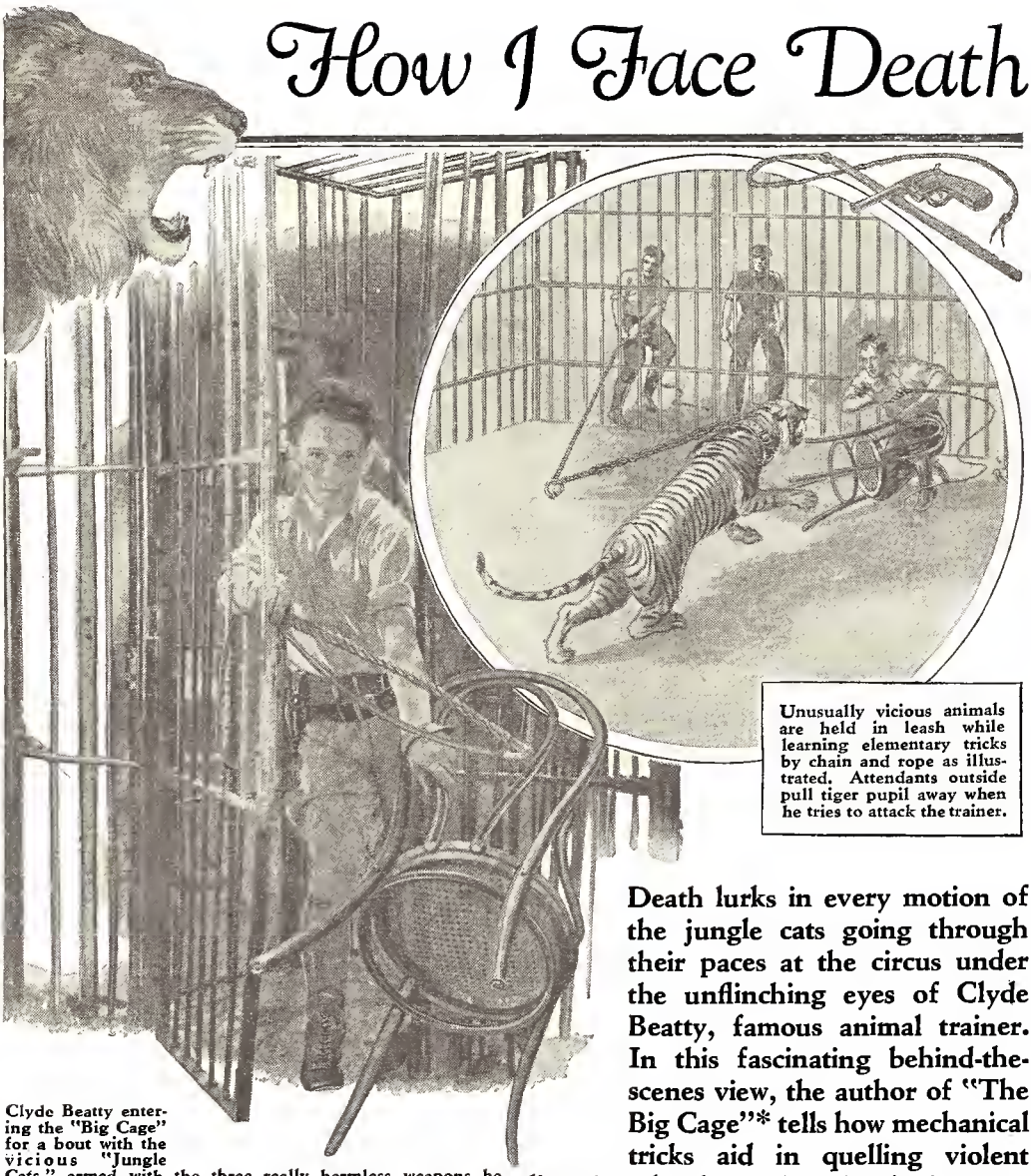
in the STRATOSPHERE


100 % INFLATED 11 MILES HIGH
OVERFLOW OF GAS WHEN CEILING IS REACHED
GAS ESCAPING DURING DESCENT
RARIFIED AIR CAUSES GAS TO EXPAND AS BALLOON RISES
75 % INFLATED
50 % INFLATED
BASE OF STRATOSPHERE 30,000 FT.
BALLAST THROWN OFF DURING ASCENT
LEAD DUST BALLAST
TROPOSPHERE
35 % INFLATED
25 % INFLATED
BALLOON RAISED BY HEAT OF RISING SUN
MORNING
GAS ESCAPING FROM RIP PANEL
EVENING
END OF FLIGHT
BEGINNING OF FLIGHT
INFLATING BALLOON
BALLOON TAKES OFF AT MIDNIGHT AND LANDS THE NEXT EVENING (20 HOURS LATER)
saunders
RIP CORD PANEL
GAS ESCAPE VALVE TO CONTROL DESCENT
GAS BAG FULLY DISTENDED AT CEIL NG
INSIDE VALVE CONTROL ROPE HANGS INSIDE OF GAS BAG
99 1/2 % PURE HYDROGEN FILLING
RIP CORD INSIDE OF GAS BAG
TOP RING USED TO ANCHOR BAG WHILE INFLATING
800 000 CU FT CAPACITY OF GAS BAG 20% INFLATED AT TAKE OFF
GONDOLA SUSPENDED FROM LOWER RING
APPENDAGES USED TO FILL GAS BAG AND TO RELEASE OVERFLOW OF GAS WHEN CEILING HAS BEEN REACHED
ENTRANCE TO AIRTIGHT DOWMETAL GONDOLA WEIGHT 196 LBS. 2/3 WEIGHT OF PREVIOUS GONDOLA
OBSERVATION PLATFORM
SAND BAG BALLAST
FUNNEL USED TO RELEASE LEAD DUST BALLAST
BALLAST, OCCUPANTS, AND INSTRUMENTS WEIGH 550 LBS.
ANTENNA AND DRIFT INDICATOR
ROPES USED BY GROUND CREW AT TAKE OFF

Flight schedule is illustrated in the panel at the left above. Climb into sky begins at 11 p. m. to permit gradual, controlled ascent. Maximum altitude is reached at about 3 p. m. in afternoon of following day. Ballast is dumped to ascend, gas is valved to descend. Details of the stratosphere balloon construction are seen at right. Large circle shows size of envelope at 11 miles altitude, where intense sun's rays and rarified atmosphere cause gas to expand to four times earth volume. Fliers ride on the "roof garden" till they reach about 15,000 feet in early morning.

How I Face Death



Unusually vicious animals are held in leash while learning elementary tricks by chain and rope as illustrated. Attendants outside pull tiger pupil away when he tries to attack the trainer.

Clyde Beatty entering the "Big Cage" for a bout with the vicious "Jungle Cats," armed with the three really harmless weapons he uses to control his charges—a whip, an ordinary chair, and a revolver which is loaded with half a dozen blank cartridges. Reports of the blanks intimidate the enraged beasts.

Death lurks in every motion of the jungle cats going through their paces at the circus under the unflinching eyes of Clyde Beatty, famous animal trainer. In this fascinating behind-the-scenes view, the author of "The Big Cage"* tells how mechanical tricks aid in quelling violent lion-tiger battles and in developing savage jungle beasts into brilliant actors.

CIRCUS-GOERS who sit breathlessly watching me put my jungle cats through their paces in the big cage, and expecting a howling bedlam to break loose at any moment, are seldom aware that their expectations are much closer to realization than they would like to believe!

Behind the seemingly orderly procedure of my animal acts in the big cage there seethes the pent-up fury of vicious jungle beasts who not only hate their human master, but also their fellow performers, and sometimes, I think, even themselves.

A violent storm of animal vengeance always impends, and when it breaks all the resources of human will power and scientific ingenuity are required to bring peace and quiet again.

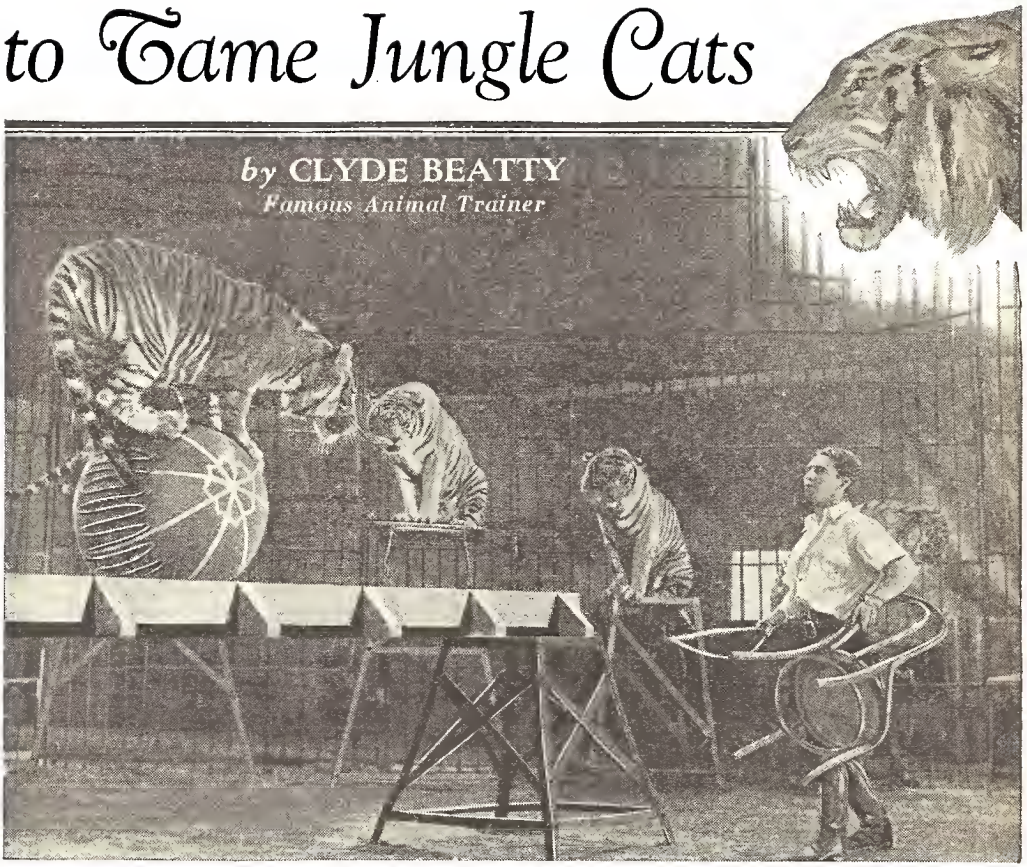
An experience that comes close to being the greatest thrill of my life took place when we were playing at Collinsville, Pennsylvania. This dramatic happening has since become known around our show as the Battle of Collinsville.

My animals had behaved well for five consecutive performances, and I was anticipating no trouble—that is, nothing out of the ordinary—when we reached this Pennsylvania town. All went well during the

* Published by Century Co.

to Tame Jungle Cats

by CLYDE BEATTY
Famous Animal Trainer



Beatty is here seen teaching one of his especially bright pupils to "walk the ball." The wooden globe is covered with a thick matting which permits the tiger to get a firm grip, and rolls between two rails, as shown, to prevent side-slipping.

afternoon performance, but the evening performance saw my act pretty nearly wrecked.

It was then my regular practice, in getting things under way, to start by letting three tigers into the arena. They were trained to take the three high pedestals.

Then I sent the lions in—twenty males and females—holding back the rest of the tigers until their enemies were seated.

My lions always mill around on the floor until I make my entrance. There is a throng of lions about the safety-cage where I stand, armed with chair, gun and whip, ready to fight my way into the arena.

As I stood peering out of the safety-cage that day in Collinsville, one of the lions leaped high up without warning and dragged Rosie, "the roll-over tiger," down from her lofty seat.

As Rosie landed on the floor, lions started after her, but she fought herself free before any one of them could secure a real hold, and scrambled back to her perch. She was just getting seated as I made my entrance. Cracking my whip and blazing away with my gun, I quickly got the lions up on their pedestals. Then I let in the rest of the tigers and seated them.

When this is done, and all my cats are ranged around the arena, I have formed the living pyramid that features the first part of my act.

I had hardly pyramided the group when Snip, a tigress, jumped off her pedestal and ran under the pedestal occupied by a scrappy lioness. Infuriated, the she-lion jumped down on top of "Snip." Then, almost instantly, Duke, the big lion that had started the fight with Rosie a few minutes earlier, jumped down off his pedestal and grabbed a tiger.

All the other tigers except three jumped to the floor of the arena—not so much to join the fight as to be in readiness to leave the arena. There are no greater scrappers than tigers, but they avoid fights, whereas the lion instinctively starts a fight. The tigers had hardly touched the floor of the arena when the lions, every single one in the act, were after them. Each lion was making a lunge for the nearest tiger.

The arena was now in an uproar. It fairly quaked with the struggles of the combatants. All of my animals except three tigers—Rajah, Empress and Rosie—joined the awful free-for-all. This meant that twenty lions were fighting nine tigers; and

A feature of Beatty's animal act is that he mixes lions and tigers together in the cage, which is like mixing gas and flame. Mortal enemies, these two beasts quite frequently clash in fatal combats during an act. A lion lunges at a tiger, and in an instant all the other performers join in the fray, making the cage a screaming bedlam. Most effective weapons to restore peace and quiet are ammonia bombs and powerful streams of water from a fire hose. These choke the beasts and cause them to unloose their fangs from their fellow actor's flesh to get the fresh air. Three lion vs. tiger battles Beatty has had to quell are shown here.

Here a lion and a tiger are seen about to leap upon each other in the midst of an act, while Beatty seeks to distract their attention by cracking a whip.

A tiger making a swipe at a lion ready to retreat from the melee. The combatants battle to the death unless separated.

unless I could quell the riot that in its opening moments breathed more hate and murderous intent than any animal fight I had even seen, it was a reasonable certainty that some of my tigers would be wiped out.

There was only one thing for me to do and that was to get out of the arena if possible and from the outside try to drive some of the combatants through the tunnel and back into their cages. The tunnel door was wide open. So great was the din of the battle that the boy at the door was unable to hear my cry: "Let 'em out. Let 'em out!" But my frantic gestures had made clear my meaning.

Nothing, however, was accomplished. The tigers would have been glad to leave the arena, but there were too many lions on top of them.

All around me I could hear the shrieks of horrified spectators. I was a bit dazed from the shock, but my head cleared and I set to work doing what I could to break up the fight. Assistants had been standing ready to pour ammonia into the arena, but they feared that in addition to affecting the animals the fumes might overcome me. I signalled them to let fly. At once several of the struggling beasts, coughing and choking, dashed for the tunnel door. Only nine animals now remained in the arena—seven lions and two tigers, one of the latter obviously dead. Yet the lions continued to maul the lifeless body.

Lion and tiger locked in mortal combat. The tiger is a better scrapper, says Beatty, but he always avoids a fight if he can, whereas the lion attacks at every opportunity.

I decided to go in and break up the remnant of the fray. One of the animals lunged for me as I neared the group, but I turned him with a blaze from my blank-cartridge gun. Then, alternately using my chair, a pole, and a gun, I drove the last of the warriors from the arena—all except the two tigers. One was dead and the other, Snip,

was badly injured. Poor Snip died three hours later.

The Battle of Collinsville made a lasting impression on me. For weeks, in my sleep, I could see that pack of lions and tigers together in deadly combat. The experience came as close to unnerving me as any I've ever had—perhaps a little closer.

However, no matter how much trouble my charges may give me, I never bear them any grudge. Long years of intimacy with them have taught me their habits and limitations, and I find we get along much better when I try to understand them rather than beat them into sullen submission. That's the reason, no doubt, why I know them so well.

Four animals out of five can be taught to perform if they are started early enough—that is, when they are between two and two-and-a-half years old. When I say, however, that most animals can be trained if they are started early enough, I do not mean to imply that most of them can be developed into expert performers. Only a select minority possess that indefinable spark and ready responsiveness that a trainer quickly recognizes as arena genius.

When an animal is unusually tough or the time for breaking him in is limited, his first appearances in the training-den are controlled from the outside. A leather collar, about two and one-half inches wide, is fastened around his neck. When the beginner is a lion or a tiger, the leather used is heavy and every inch of the collar is reinforced.

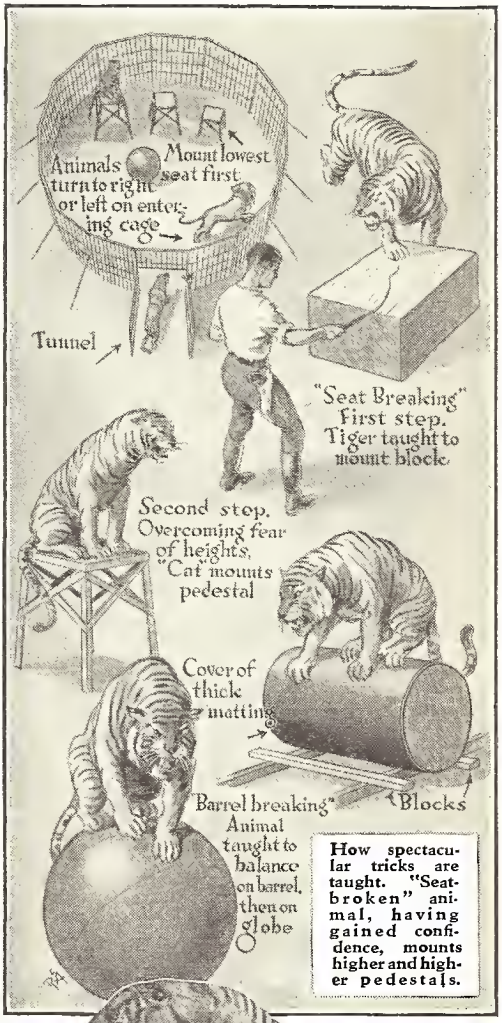
Breaking in Mean "Cats"

A heavy steel ring, with plenty of play, is slipped over the collar before the latter is attached. To this ring a chain about two feet long is fastened and to the chain a heavy rope is tied. The big cats are very expert at the business of chewing a rope in two, no matter how heavy, and the chain serves to keep the rope out of their reach.

The rope is slipped through a heavy iron ring on the arena floor and then through the arena bars, where it is held taut by attendants who pull the pupil away from the teacher when the pupil attacks too viciously.

My first job after my pupil has become used to his new surroundings is to get him to practice cage entrances. I "break" him to go to the right or the left when he leaves the tunnel and enters the arena. Whichever side I dictate, that's his side of the arena during the early stages of his career.

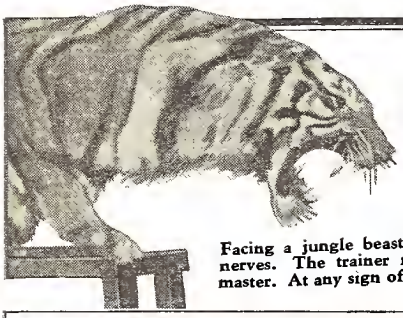
Once I make an animal understand clearly whether he is to go to the right or left on entering the arena, I devote myself to "seat-breaking" him. The first seat used is what is known in the animal-training world as a "block-seat." This is a solid block of wood that simplifies matters considerably.


Animals turn to right or left on entering cage
Mount lowest seat first
Tunnel
"Seat Breaking" First step. Tiger taught to mount block
Second step. Overcoming fear of heights. "Cat" mounts pedestal
Cover of thick matting
"Barrel breaking" Animal taught to balance on barrel, then on globe
Blocks

How spectacular tricks are taught. "Seat-broken" animal, having gained confidence, mounts higher and higher pedestals.

Snarling and resentful, a jungle cat here is dropping to his haunches as the first step in the famous roll-over stunt. Trainer must give instructions by remote control—obviously he cannot pick up tiger and roll him over like tame animal.

Trainer Holds "King of Jungle" at Bay With Legs of Ordinary Chair



Facing a jungle beast in the big cage demands steel nerves. The trainer must show the tiger that he is master. At any sign of weakness the animal will attack.

Left—Beatty teaching one of his striped cats the famous "roll over" stunt. Act is taught in steps, which are assembled into a complete act.

Chief weapons and tools of the trainer are the chair and the whip. Crack of the whip attracts the attention of the beast and serves as cue to various steps of act. The lion is held at bay with a chair, whose legs, pointed toward him, he fears.

The average lion or tiger, motioned toward such a seat, understands that you want him to get up on it.

The next move is to cue him to clamber up, which is not difficult to do except when you are dealing with a suspicious animal. Irrespective of how much of a doubting Thomas an animal may naturally be, once his trainer gets him on a block seat and he sees that nothing is happening to him, he is sold.

While I always start the "seat-breaking" of an animal by teaching him to get up on a block seat, I also have regular pedestals, of different heights, in the arena. After a pupil has been block-seated, it is fairly easy to make him try the other pedestals. When he finds he can go scampering from seat to seat until he reaches the highest perch in the arena without anything happening to him, he begins to develop confidence in his new surroundings.

Within a month, I usually have a rookie animal taking any one of six seats in the arena. I keep him hopping from pedestal to pedestal at my command. Then one by one, five of the seats are removed and the pupil soon understands that the one remaining is his own special perch in the ring.

Globe-rolling is a real step forward in the career of a big cat—lion, tiger or leopard—that is studying to be a performer. When I start an animal on such advanced work, it is a definite sign that he or she is definitely schooled in the A-B-C's.

(Continued on page 28)

Phone Amplifier Steps Up Voice for Hard of Hearing

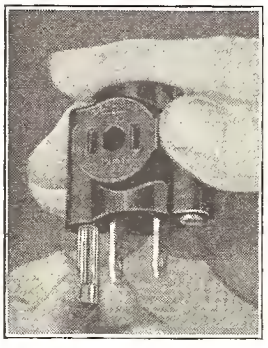
THOSE who are hard of hearing now may sit at their telephone and, by turning a dial, "step up" the sound coming through the receiver to a volume to fit their particular needs.

The new telephone amplification equipment, shown at the right, consists of an ordinary telephone, the control box containing the "peanut" vacuum tube and a small cabinet containing a switch-key and rheostat.

Batteries are installed near the instrument. The key switch throws the amplifier in or out of the telephone circuit so that the phone may be used both by persons with normal and those with impaired hearing. Scientists in the Bell Telephone laboratories developed the tiny tube.

Incoming voice is stepped up for the hard-of-hearing by turning knob on box to point delivering adequate volume.

Individual Fuses for Appliances



Individual fuses fit into this new wall plug as shown above.

A NEW fused wall-plug which localizes blow-outs saves the handy-man the irritating task of having to search through the fuse block for the circuit that's out of order.

The plugs have self-contained fuses which blow open when the particular appliance it is serving uses too much current. Thus only one appliance is disconnected, while others on the circuit continue to burn. The fuse is a small glass enclosed cartridge which slips into the side of the plug as shown in the accompanying photo.

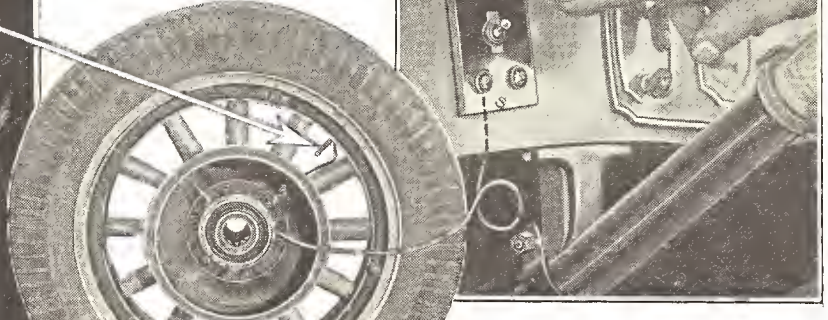
Buzzer, Lights Warn of Soft Tire

AUTOMOBILE drivers who like to keep a constant check on their tires will welcome a new device which tells when any one of the tires has gone too soft for safety.

A buzzer on the cowl sounds the warning, and one of four red lights on a panel on the dash tells which tire reached the deflation danger point.

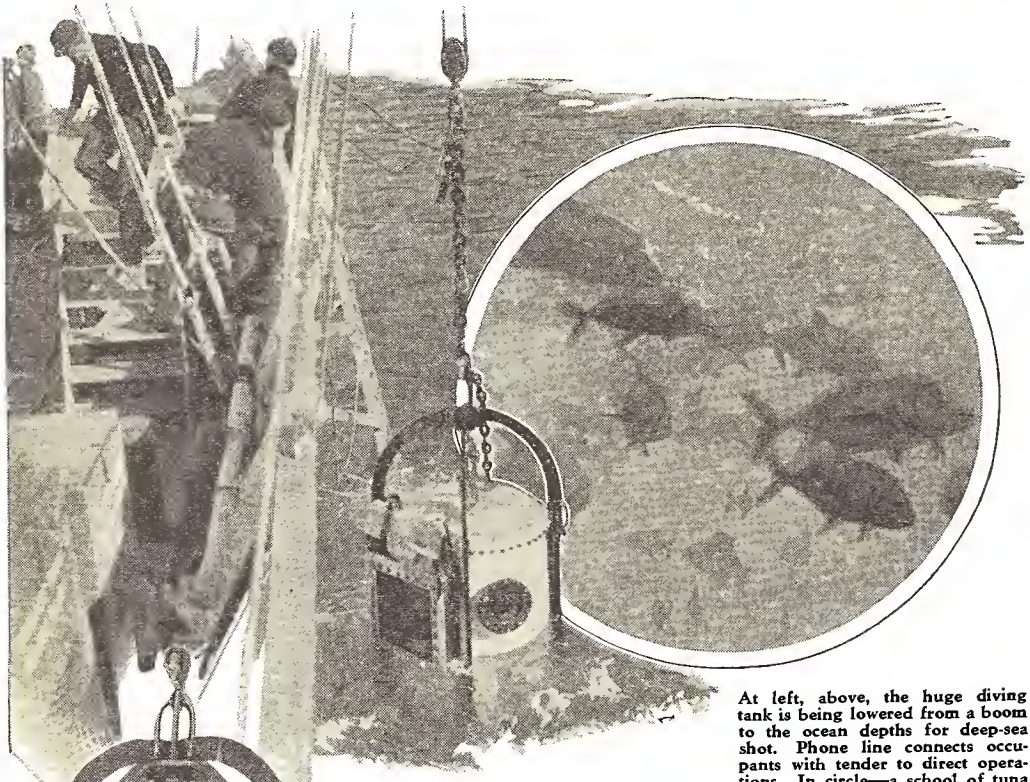
The tires, shown below, are equipped with special valve stems which close a circuit when the minimum pressure allowed by factory specifications is exceeded by five pounds. The closed circuit passes the electrical impulse to a collector ring inside the brake drum, thence to dash.

Here is seen the valve which sounds warning when the tire gets too soft for safety.

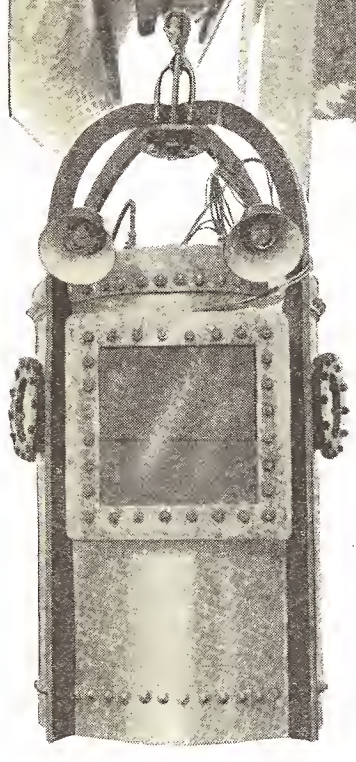


When tire pressure lowers to danger point, the special valve stem closes an electrical circuit which passes through the collector ring and carbon brush to the dash panel, where buzzer sounds a warning and light flashes to warn driver.

Strange PERILS of Making



At left, above, the huge diving tank is being lowered from a boom to the ocean depths for deep-sea shot. Phone line connects occupants with tender to direct operations. In circle—a school of tuna —the race horses of the sea.



Through the plate glass windows of this huge diving bell Mr. Scott has filmed many of his thrilling deep-sea dramas. With heavy lead flooring, it descends to 180 feet below the surface.

by HOMER SCOTT

Pioneer Underwater Cameraman

IN 14 years I probably have gazed into the cold eyes of more curious fish and looked on the bodies of more actors and actresses beneath the sea than any other man.

From the shores of Southern California to the rocky coast of the Socorro islands, far south in the Pacific, and even off the shores of New Zealand I have descended many times in one of my half-bells, my legs dangling puppet-like in the cold water, to photograph dramas that sometimes thrilled me more than were the audiences that viewed the results on the screen.

When the editors of MODERN MECHANIX AND INVENTIONS asked me to write of the thrills and tell you how these scenes are filmed, I said to myself, "Gosh, there's nothing very interesting about undersea picture-taking."

But as I sit pondering the problem, it occurs to me that possibly I have had a privilege denied to all but a few men—to see human life mingling with the unknown beneath the ocean, to study native life beneath the sea, to experience death close at hand, only to escape with seconds to spare.

How many times I have been plunged into the Pacific from the yard arm of some rocking ship I can't even guess. But I remember one episode with a strange vividness. We had gone one fine day to the waters off Catalina Island to record the finding of a prop treasure chest 50 feet below the surface. Above me, as I was being lowered away,

MOVIES Beneath the Sea

Hollywood's most intrepid cameraman relates startling adventures he has encountered making undersea movies which chill your blood.

Movie men on mother ship rescuing Scott, unconscious, after he came near drowning as diving bell cable parted.

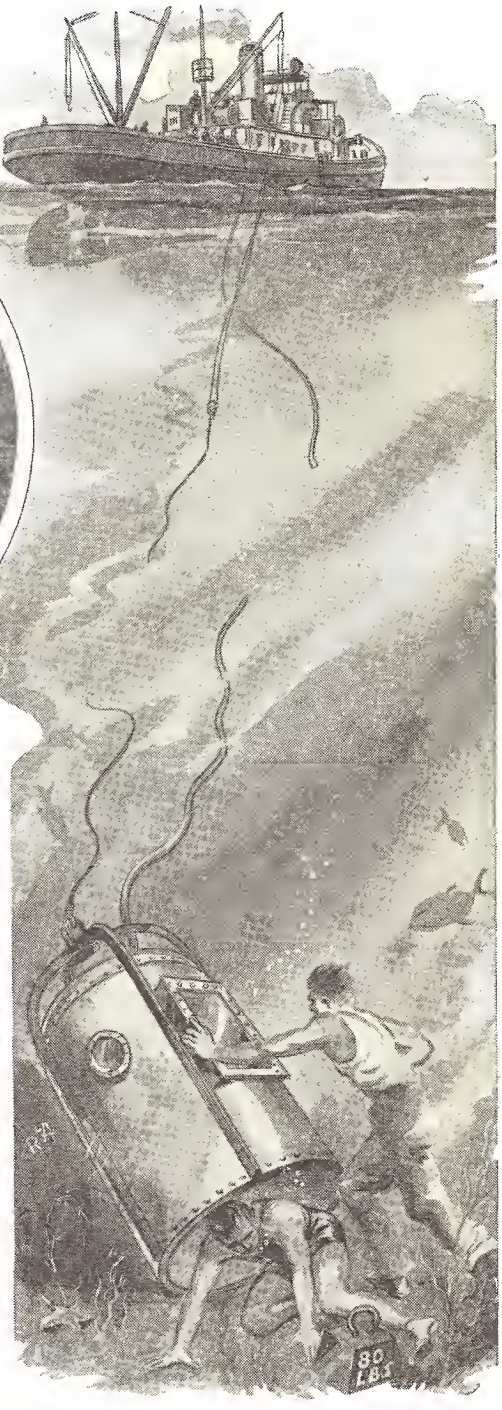
stretched a nearly-new steel cable which had been recently tested to a breaking strength of 30 tons. Down I went . . . ten feet . . . twenty . . . thirty. Then suddenly I shot downward. The cable had parted.

I kept my legs drawn under me as I neared the floor of the ocean, drawing great gulps of air into my lungs for the long ascent to the surface, if, indeed, I could get clear of the bell. I knew I had only a few seconds, for the air line had parted and water was pouring in through the hose.

Those on deck knew what had happened instantly when the weight was released so suddenly. Without pausing to consider his personal danger, I learned later, Fred, a prominent assistant director whom I worked with, grabbed one of the 80-pound weights and leaped overboard. The lead bore him down like a millstone, and within five seconds after I had struck bottom, I saw his form looming up through the window.

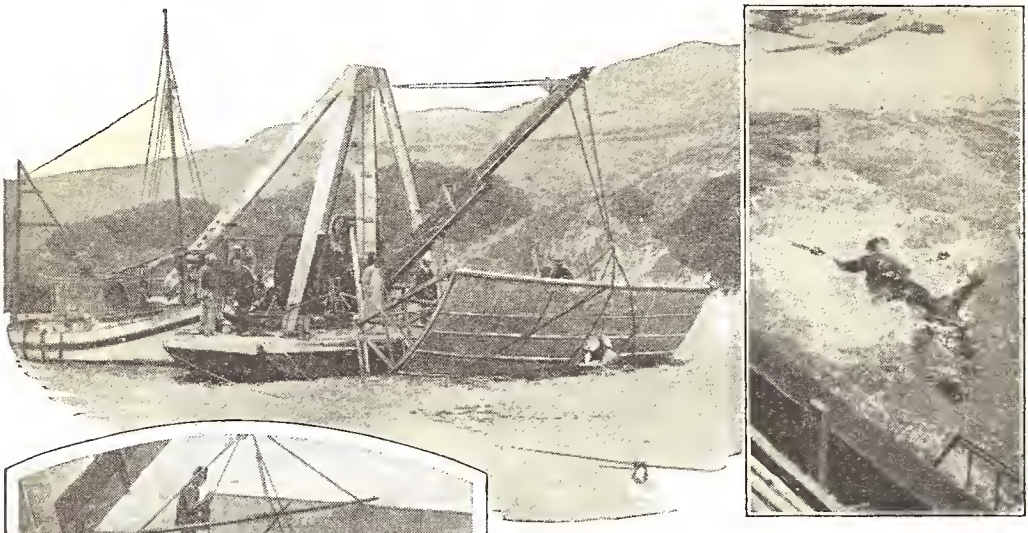
Quicker than you take to read this sentence, he upturned the bell. This enabled me to slide out, and, with our lungs nearly bursting, we cracked through the surface a few seconds later where eager hands pulled us aboard the tender.

Recently in filming "Beneath the Sea" I had occasion to work with one of the largest photographic diving bells ever con-



One of Scott's most thrilling adventures. When cable parted, movie man on tender seized weight, dived to bottom and overturned the diving bell in which Scott was imprisoned by cable break. With lungs nearly bursting, the cameraman swam to surface and safety.

Workmen Fabricate Synthetic Ship's Hull From Concrete and Wire Mesh



Left—Planting the hull of sunken ship on ocean bottom preparatory to filming underwater treasure hunting scene. Right—Man-eating shark viciously attacking dummy man.

When movie script called for act taking place before hull of sunken ship with gaping hole, movie mechanics constructed this artificial hull from concrete and wire mesh.

structed for motion pictures. This bell, whose picture appears on these pages, was made of steel and stands seven feet, six inches high and measures nearly five feet in diameter. It will withstand water pressure at a depth of 180 feet, though this is four times deeper than I have ever filmed a human actor. Emergency flasks of oxygen stand ready for instant use in case the bell breaks from its cable and falls to the bottom of the sea.

Like all such modern contrivances, it carries a telephone and a microphone, in order that the voices of the actors may be recorded on the ship above. With a heavy flooring of lead, the bell weighs nearly two and a half tons. It rests in a frame of heavy steel straps.

Every time I descend from a ship in a bell, I think the fish below must be amused to see my legs dangling through the open bottom. You see, I sit on a saddle behind the camera, which is mounted on a bracket. Though my larger bell weighs, after the 80-pound lead weights are attached to the outside hooks, nearly two tons, I must keep my feet free to walk around the bottom.

Yes, sir! More than once I have walked along the floor of the Pacific with two tons of lead on my shoulders and my head in the big air bubble, which, by the way, helps support the great weight and makes such walking possible.

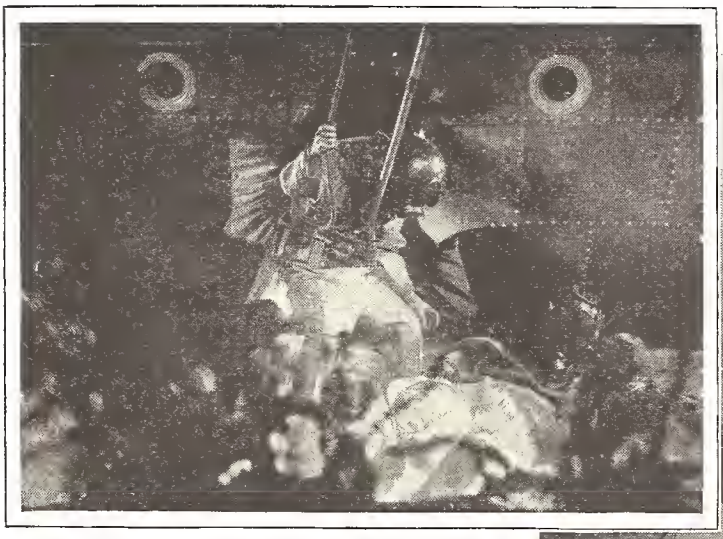
Movie Set Goes Haywire

On one occasion I had descended off the California coast for a scene which required me to walk beneath the bell, photographing the side of a prop ship which had been planted there several days earlier. The set around which I was working demonstrated better than any on which I have worked beneath the Pacific just how elaborate an undersea scene may be made. For weeks prior to our arrival there, workmen had been fabricating the side of the ship, heavy concrete moulded into wire mesh, with enough steel and wood to hold it upright in a mild sea.

Near the center, below the water line, had been built a jagged hole, representing the results from a terrific impact. An actor was to crawl out of this hole, bearing with him treasure from the galleon.

I descended and focused on the hole, awaiting the actor. We were not more than 15 feet down at the time. Just at that moment a ground swell began to move inshore and, as I looked on in dismay, the set slowly toppled over, disintegrated and settled to the bottom.

Reflected by Mirrors, Sunlight Illuminates Underwater Movie Scenes



How an underwater scene appears to the camera eye. Actors and ship's hull are illuminated by sunlight. Figure of drowned woman is made of waterproof wax.

Unfortunately the builders had not counted on the effect of salt water on the fastenings and had built the ship too quickly and of inferior materials. Fortunately, however, we had had seven days' work on it already and scenes filmed earlier were made to answer the studio's needs.

In filming scenes of people, fish and inanimate objects we never use lights. We are able, occasionally, to reflect sunlight onto our objectives. These are the ordinary brilliant reflectors, of silver or gold color, used in the studios and on location to bend light rays directly on the scene. Here, however, they are lowered on ropes and poles into the water.

Illuminating Underwater Stage

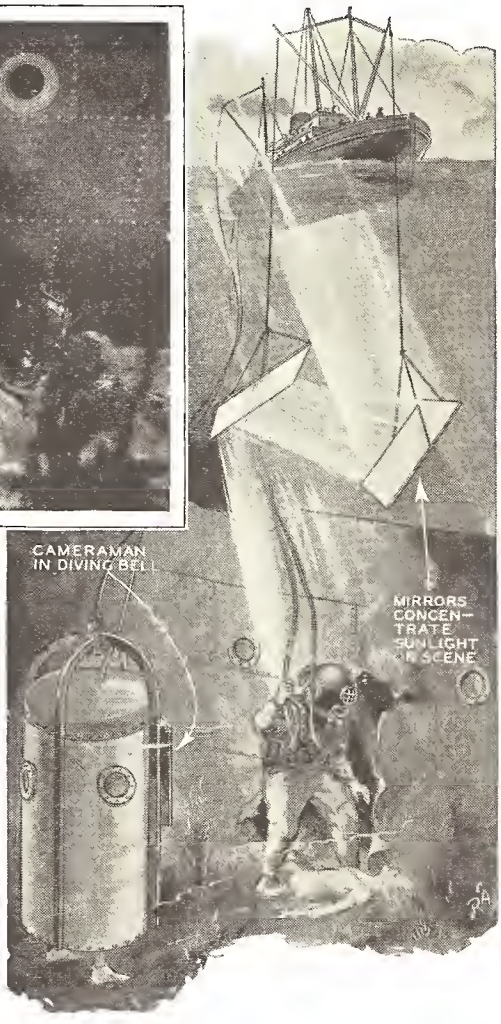
Divers tell me, and I agree from long experience, that lights generally are unsuccessful under water for the reason that only lights of great power can be used and these become so hot that they quickly burn out.

I have tried to make my bells as livable as possible, for I spend many of my waking hours in them. Many days I spend five hours below water on my little seat, focusing on new scenes, changing magazines, swinging back and forth with the tides.

There in the dark I pan the camera around, tilt it up and down on its stationary tripod and otherwise handle it exactly as I would on a sound stage instead of in the depths of the world's greatest stage—the ocean.

Not only can I manipulate the camera easily, but with the help of people on deck can direct both people and fish. Human actors, of course, must be told before they dive overboard exactly what to do.

Oddly, as far as underwater direction is concerned, we can guide fish more easily than humans.



Ordinary stage lights are unsuitable for illumination of underwater scenes. Instead, huge silver and gold reflectors, suspended from mother ship, reflect sunlight on the setting.

One afternoon I was dangling beneath the camera ship off the Cocos islands. We had been waiting several hours for fish. At last a big school of tuna appeared. Fred, on deck, warned me that we were easing in among the school.

"Okay," I replied. "Throw chums over the right side of the bell."

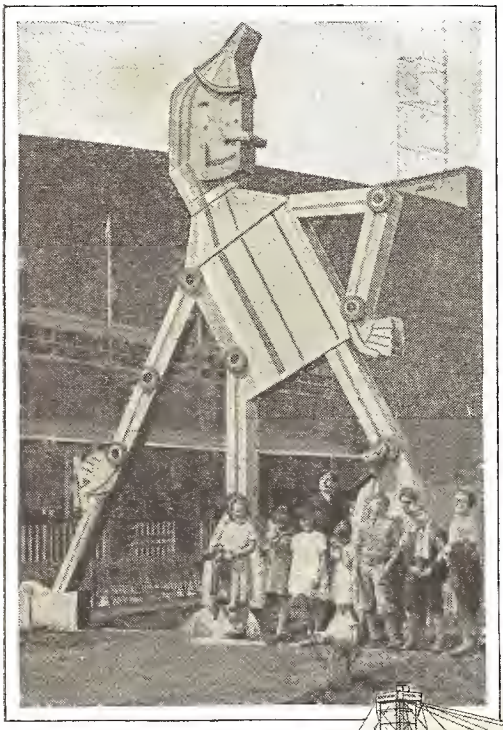
In a moment I saw the fish move in that direction. As soon as none remained within my vision I reported.

"They're off my starboard beam," I said into the 'phone. "Toss chums in on my left and 20 feet in front."

I started the camera, knowing I soon would have a swell picture. There they came, these race horses of the sea, dashing to the meal as they would attack fiercely anything that might stand in their paths.

(Continued on page 127)

MECHANICAL Wonders



The Tin Woodman on Enchanted Island stands fifteen feet high, and is one of the mechanical manifestations of the realm of childish fancy brought to life at the Century of Progress Exposition. Every delight known to kidland is in this Fairyland.

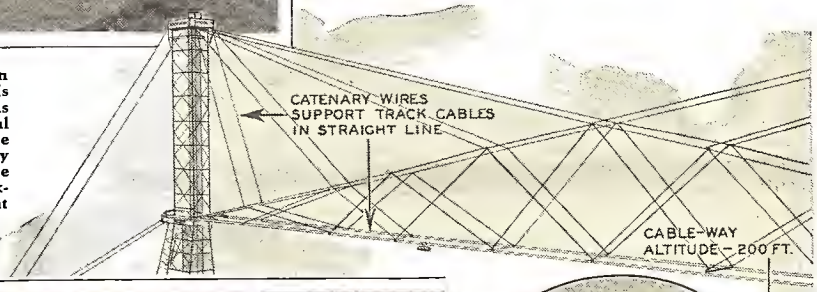
"CENTURY of Progress" is the name given the 1933 Chicago World's Fair, and the whole show is well named, for it is an exposition depicting the progress of man's advance in civilization in the last 100 years. And this progress revolves almost entirely around the advances made in science and mechanics in that length of time.

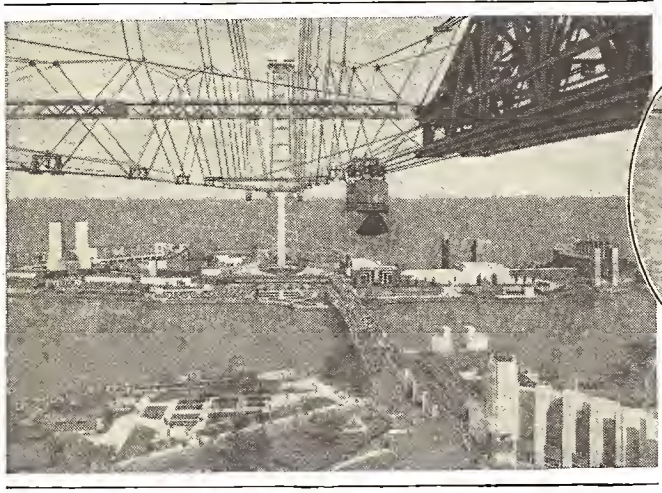
Every conceivable mechanical oddity worth displaying is on show, and each month during the course of the exposition MODERN MECHANIX AND INVENTIONS will display for readers who are unable to view the fair an increasingly augmented series of unusual pictures to help carry the true import of the exposition.

Among the most interesting entertainment novelties is an "Airplane Ride" which is shown in the illustration to the right. A series of loose roller coaster cars, with stub wings, is sent down a dizzy spiral half-tube, so constructed that the train of cars cannot roll out.

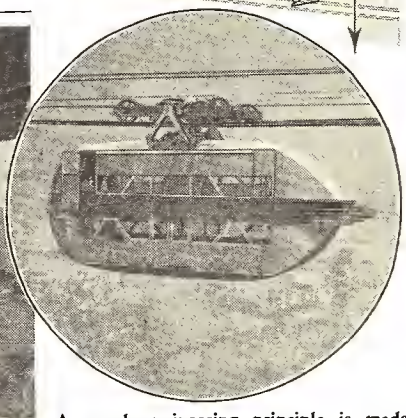
Eclipsing even the famous Ferris Wheel of the 1893 World's Fair is the modern "Sky Ride," which bristles with engineering novelties.

In thoroughly safe cable cars, one may ride a third of a mile through the air 200



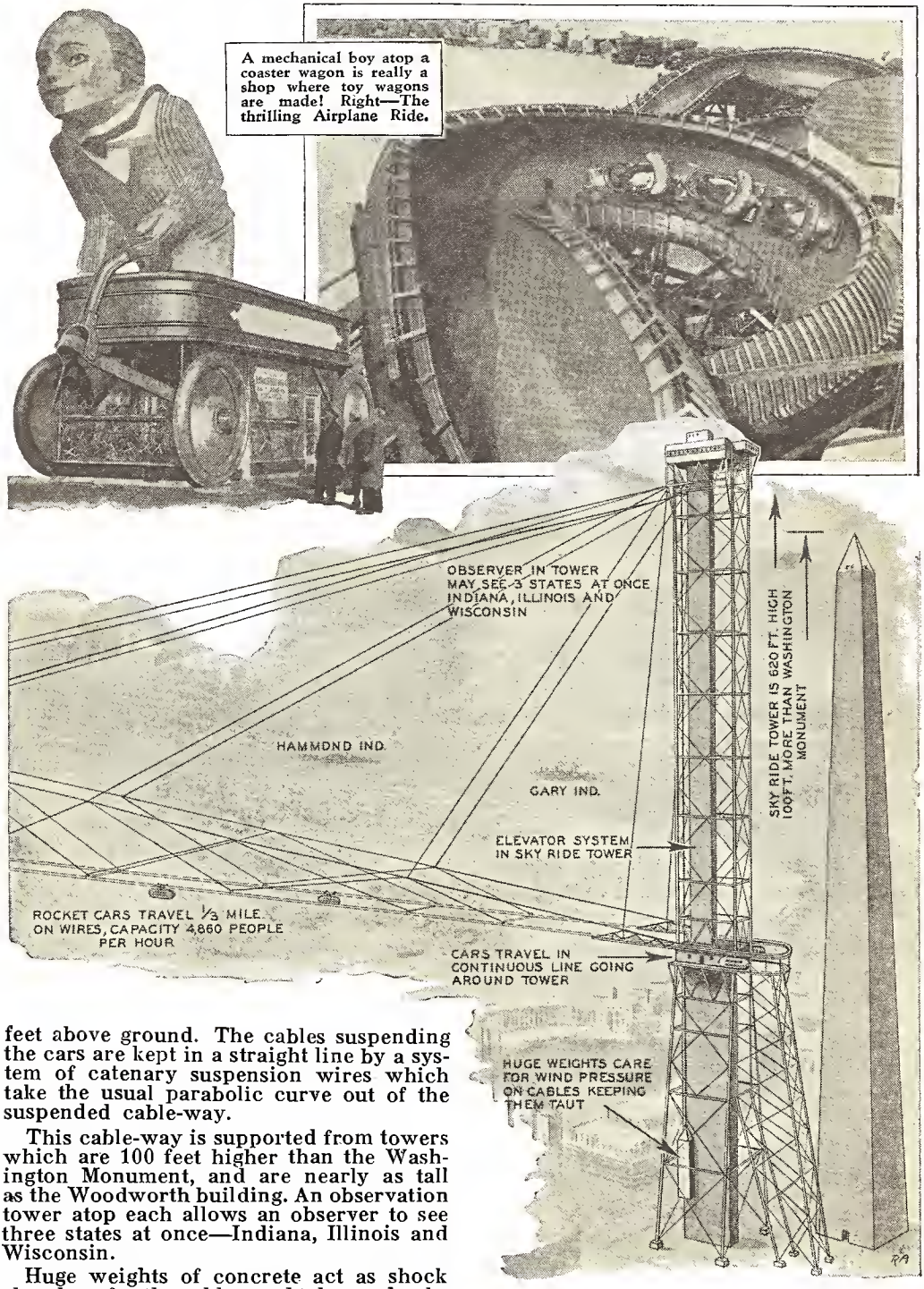


Proving even greater an attraction than the Ferris Wheel as a thriller is the 1933 Sky Ride, which gives you this beautiful view of the whole show.



A novel engineering principle is made use of in the thrilling Sky Ride in keeping the suspended cables in a flat line. Normally suspended cables follow a parabolic curve, but by the use of catenary cables the load is so disposed that the cables on which Sky Ride car, shown above as snapped from another car, form level tracks.

# of Chicago WORLD'S Fair


OBSERVER IN TOWER MAY SEE 3 STATES AT ONCE INDIANA, ILLINOIS AND WISCONSIN
HAMMOND IND.
GARY IND.
ELEVATOR SYSTEM IN SKY RIDE TOWER
SKY RIDE TOWER IS 620 FT. HIGH 100 FT. MORE THAN WASHINGTON MONUMENT
ROCKET CARS TRAVEL 1/3 MILE ON WIRES, CAPACITY 4,860 PEOPLE PER HOUR
CARS TRAVEL IN CONTINUOUS LINE GOING AROUND TOWER
HUGE WEIGHTS CARE FOR WIND PRESSURE ON CABLES KEEPING THEM TAUT

A mechanical boy atop a coaster wagon is really a shop where toy wagons are made! Right—The thrilling Airplane Ride.

feet above ground. The cables suspending the cars are kept in a straight line by a system of catenary suspension wires which take the usual parabolic curve out of the suspended cable-way.

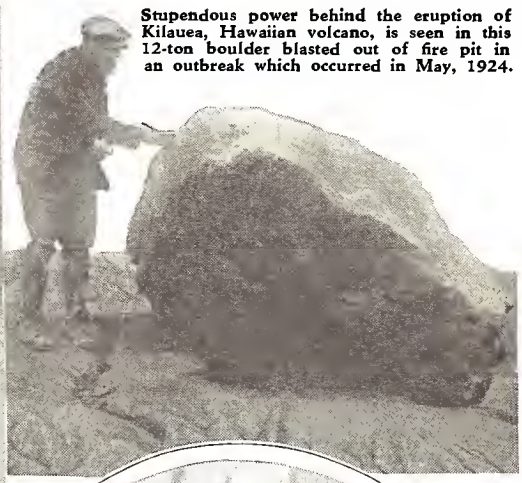
This cable-way is supported from towers which are 100 feet higher than the Washington Monument, and are nearly as tall as the Woodworth building. An observation tower atop each allows an observer to see three states at once—Indiana, Illinois and Wisconsin.

Huge weights of concrete act as shock absorbers for the cables, and take up shocks that are caused by sudden gusts of wind.

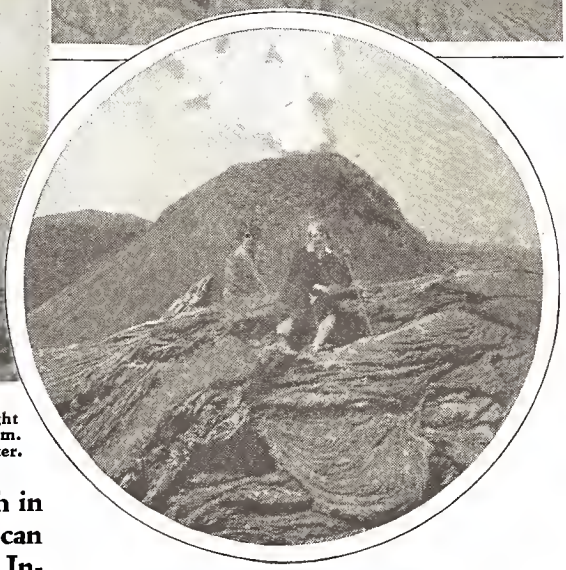
Daring engineering features of the Sky Ride include use of two towers 100 ft. higher than Washington monument.

When MOTHER EARTH

Smeroe, one of Java's most dangerous volcanoes, caught by cameraman as it spouted massive cloud of steam. Note boulders in foreground ejected from crater.



Stupendous power behind the eruption of Kilauea, Hawaiian volcano, is seen in this 12-ton boulder blasted out of fire pit in an outbreak which occurred in May, 1924.



In the outer crater of Vesuvius is seen these fantastic formations—huge folds of lava once belched forth from the interior of the earth through the constantly smoking interior crater seen in the background of this remarkable photo.

When old Mother Earth bursts forth in fiery wrath there's little puny man can do about it except run for safety. Ingenious scientific instruments, however, can predict these volcanic outbreaks and thus warn when it's time to start running, as told in this authoritative article.

SINCE the year 1500, when fairly trustworthy records begin, 98 eruptions of 57 volcanoes are known to have destroyed the lives of 190,000 people. The enormous property losses involved in these outbreaks have never been estimated.

Quite apart from the scientific interest attaching to the study of volcanoes, the figures just quoted show that these features of the earth's surface call for thorough investigation for the practical purpose of mitigating their terrors.

The scientific knowledge already acquired concerning them justifies strong hopes that science will eventually be able to predict volcanic outbreaks long enough in advance to make them harmless to the lives of men.

The average American probably thinks of volcanic dangers as remote from his personal affairs. It is true that within the United States proper there is only one nominally active volcano, Lassen Peak in California, which has been quiet since 1918.

However, great volcanic outbreaks are a possibility to be reckoned with in the United States. Several supposedly extinct volcanoes in this country may come to life in the future. Mount Baker and Mount St. Helens, in Washington state, were in eruption in the middle of the last century. Mount

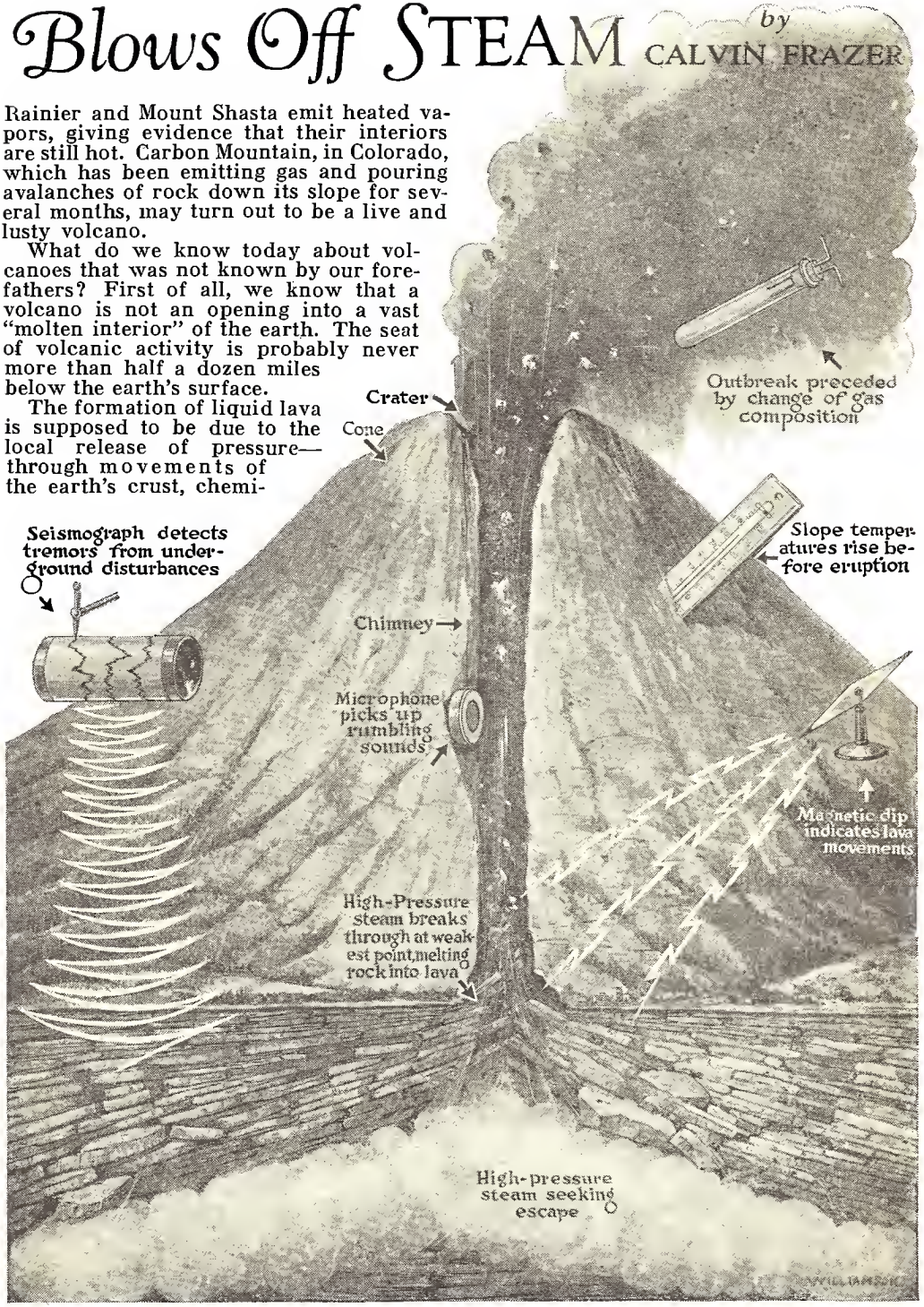
Blows Off STEAM

by CALVIN FRAZER

Rainier and Mount Shasta emit heated vapors, giving evidence that their interiors are still hot. Carbon Mountain, in Colorado, which has been emitting gas and pouring avalanches of rock down its slope for several months, may turn out to be a live and lusty volcano.

What do we know today about volcanoes that was not known by our forefathers? First of all, we know that a volcano is not an opening into a vast "molten interior" of the earth. The seat of volcanic activity is probably never more than half a dozen miles below the earth's surface.

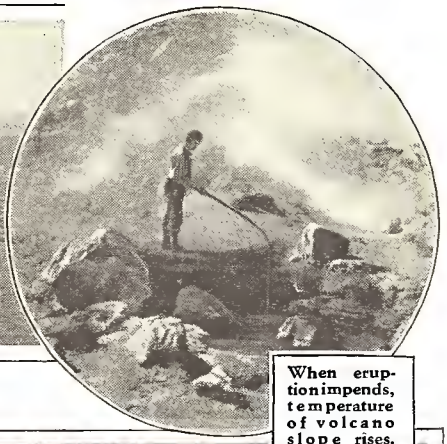
The formation of liquid lava is supposed to be due to the local release of pressure—through movements of the earth's crust, chemi-


Outbreak preceded by change of gas composition
Crater
Cone
Seismograph detects tremors from underground disturbances
Slope temperatures rise before eruption
Chimney
Microphone picks up rumbling sounds
Magnetic dip indicates lava movements
High-Pressure steam breaks through at weakest point, melting rock into lava
High-pressure steam seeking escape

Cross-section view of active volcano shows seat of eruptive power. Steam generated by stupendous weight of earth pressing down on underground waters, escapes through the weakest point it can find in the earth's surface. Five methods whereby eruptions can be accurately forecast by scientists at volcanological stations are illustrated. Seismograph indicates severe tremblings; microphone hears rumblings of grinding and boiling lava; analysis of gas shows a distinct change in composition; magnetic instruments flutter and gyrate in response to lava movements; temperature of slope rises abnormally high. Science cannot prevent volcanic upheavals but it can predict and thus warn inhabitants of towns nearby in time for them to flee to safety.

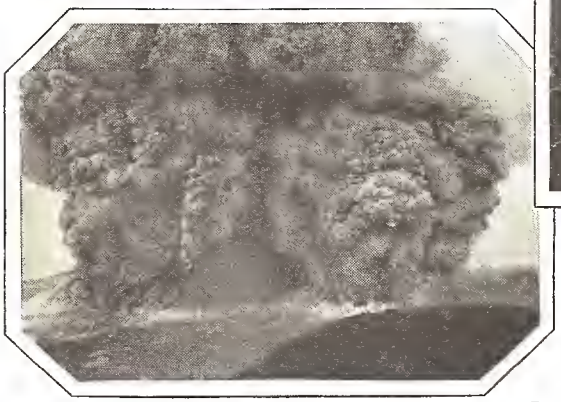
Lava in Active Volcanoes Boils Constantly, Heated by Escaping Steam

Daylight scene of interior of fire pit. Notice dense vapors arising from surface of lava. Periodically this melted rock rises to top of crater and spills over down the sides in slow-moving streams that often wreak bavoc on slope dwellers.



When eruption impends, temperature of volcano slope rises. Volcanologist is taking temperature.

Striking photo here shows boiling lava in interior of fire pit. Lava, which is melted rock, is kept at boiling point by superheated steam escaping from the vent leading up from interior of the earth.



When Mother Earth rises up in fiery wrath. Here is seen the fire pit of Kilauea belching forth clouds of black smoke generated in fire-box six miles down in depths of earth.

cal action or other agencies—on masses of rock heated above their ordinary melting points. When the pressure is released, the rock changes from solid to liquid, and its discharge is probably due, at least in many cases, to the sudden generation of steam from water in the depths of the earth.

Apart from these general facts, a great deal has been learned about the mechanism of eruptions that bears directly upon the problem of prediction. Although a majority of earthquakes are not connected with volcanic eruptions, local tremors and tiltings of the ground occur in connection with volcanic activities both before and during an outbreak.

Hence the seismograph, or earthquake-recorder, is at present the principal instrument by means of which the volcanologist feels, so to speak, the pulse of a live volcano and gains an inkling of its future behavior. Thus it happens that at the famous Hawaiian Volcano Observatory, near the crater of Kilauea, the activities of that volcano and also of the distant volcano Mauna Loa can be followed more closely by the inspection of seismograph records, made in the cellar of the observatory, than by actual ocular observation of the craters.

The great eruption of Sakurajima, in Japan, in 1914, where no previous outbreak had occurred for 135 years, was predicted from the records of a seismograph in the neighboring city of Kagoshima. By the advice of seismologists 90,000 people were removed to a place of safety before the eruption began and an immense loss of life was thus averted.

Several other methods have been utilized with much success at Kilauea, Vesuvius and elsewhere in observing the changes that go on in the interiors of volcanoes and give more or less definite warning of impending outbreaks.

Powerful microphones are employed for listening to certain characteristic sounds in the depths of the volcano.

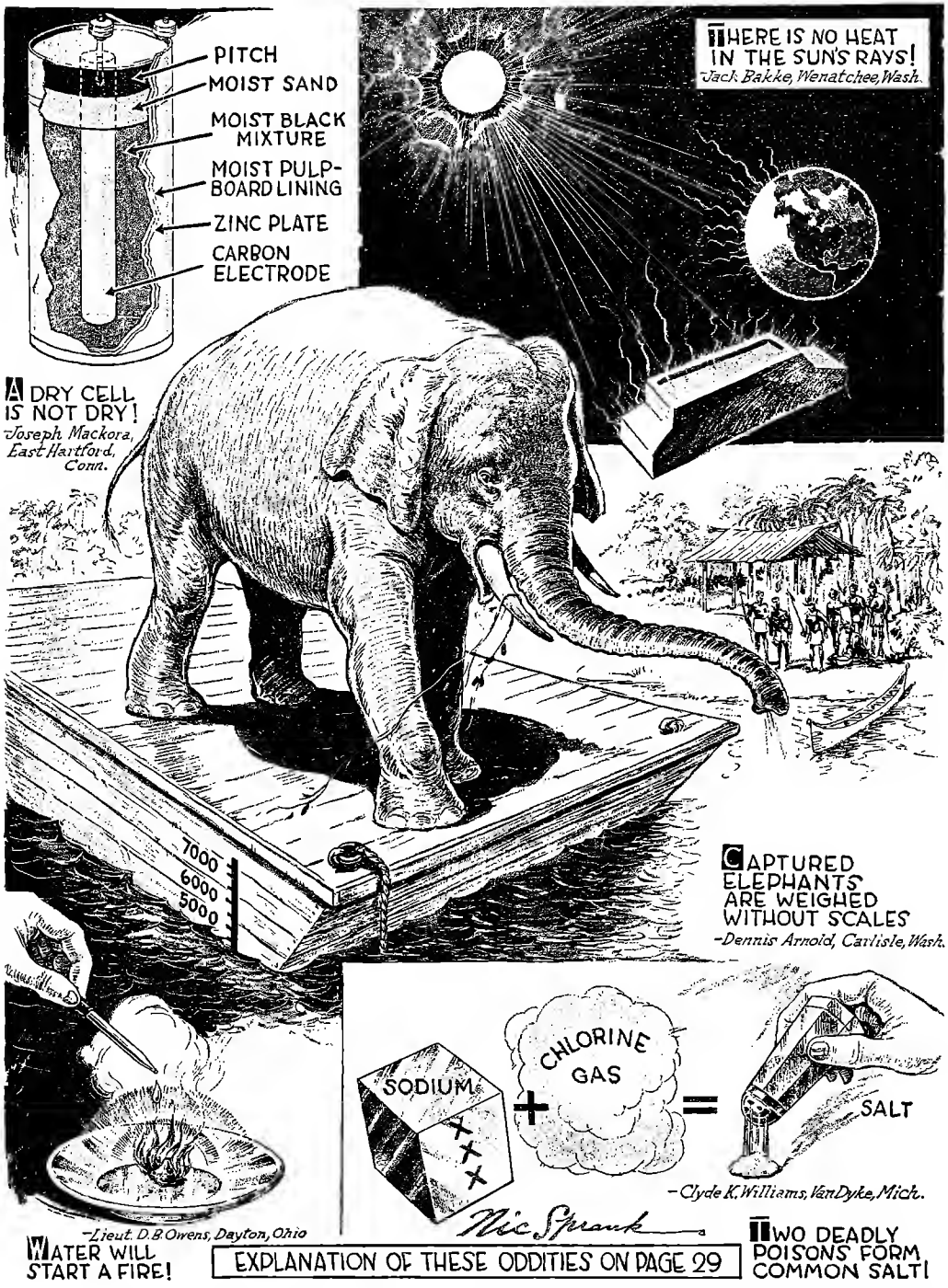
Movements of lava are detected by their magnetic effects.

Underground temperatures measured at various points on the slopes of volcanoes show a marked heating of the ground before an eruption.

Chemical analyses of volcanic gases show changes of composition in advance of an outbreak. Organized arrangements have been made in some regions of frequent volcanic activity for promptly evacuating the population from the danger zone when an eruption impends.

Oddities of SCIENCE

by NIC SPRANK



EXPLANATION OF THESE ODDITIES ON PAGE 29

These strange facts of science call to our attention a few of the things which on every hand refute some of our accepted notions about nature. ONE DOLLAR will be paid you by Nic Sprank for every Oddity he considers good enough to make this page. Try your luck! Send in something new—don't re-hash the obvious, and your chances of cadging a dollar bill are as good as the next man's. Address Nic Sprank, care Modern Mechanix, 529 So. 7th St., Minneapolis, Minn.

"Parachute" Wheel on Race Car Averts Blowout Smash-up

When rear tire of racing car blows, the auxiliary tire takes up the load, and thus prevents disastrous smash-ups when the car is roaring along, especially over a brick speedway.

MANY deadly disasters occur on the brick auto speedways when a rear tire suddenly blows open. So with a view to preventing such smash-ups in trial runs of racing cars one prominent car manufacturer has introduced a fifth wheel which takes the load when the regular tire flattens out. The "parachute" tire, as it is called because it performs similar to a parachute, fits over a smaller wheel attached to the right rear wheel on the racing bus. The extra weight slows down the machine slightly, but it is not used in the regular races.

New Tester for Radio Service Men

THE last word in efficiency and flexibility in radio set testers is offered in an "all-purpose" instrument manufactured by a prominent radio company. With this instrument at his disposal, the radio service man can almost instantly locate defective parts, open circuits, etc. Apparatus is carried in a small self-contained cabinet and is thus ideal for house-to-house canvassing.

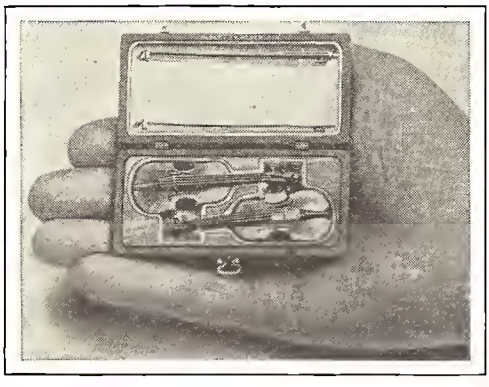
Tent Latest Thing in Inflation

CAMPERS will be quick to appreciate the conveniences offered in a new tent having no poles, but using inflated supports instead. When you wish to pitch camp for the night you simply bring a tire pump into action and after a few dozen strokes the tent begins to take shape, as illustrated in the photo below. The shelter has all the sturdiness and dependability of a pole supported tent and may be erected in less than half the time.

To pitch camp, simply attach tire pump and pump away. Poles are eliminated, but tent proves extremely sturdy.

World's Tiniest Violins 2 in. Long

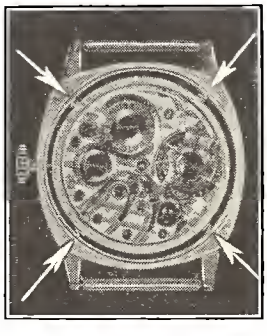
BELOW may be seen photos of two of the world's smallest violins. Masterpieces of craftsmanship, they are built throughout as genuine reproductions of the real thing. Each violin is 2 in. long, weighs 1½ grams, and uses ebony for pegs and bridge. The G-chord is of silver. Two months' hard work went into the construction of each of them.



Here are the world's smallest violins. They are two inches long and weigh 1½ grams each. Bridge and pegs are ebony.

Shock Absorbers for Wrist Watches

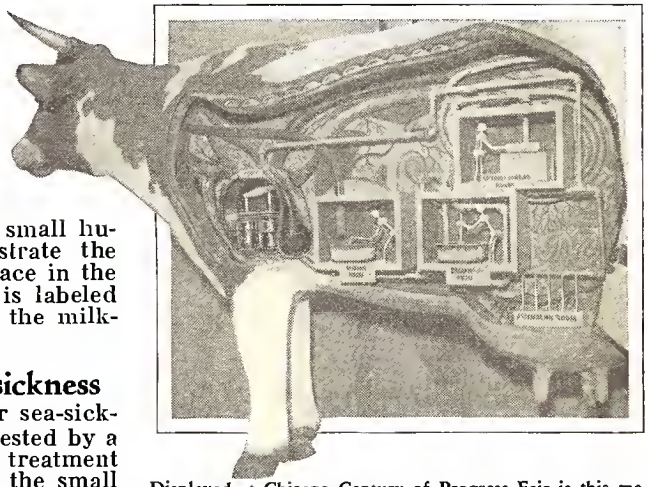
A RADICALLY new departure in wrist watches is represented in a timepiece which inventor claims is completely shockproof. The movement is mounted inside an outer shell and insulated against shock by means of four tiny springs, indicated by the arrows in the accompanying photo. In severe tests recently the watch was dropped from the top of a three-story building without slightest damage to the mechanism.



Arrows point to tiny springs which act as shock-absorbers when watch falls to the floor.

Mechanical Cow Shows How Live Ones Manufacture Milk

THE physiological process whereby a cow manufactures milk from the grass and other materials she eats is demonstrated by an amazing mechanical cow on display at the Chicago Century of Progress Fair. A cutaway view of the cow's innards shows by a series of pipes the route of the materials which go into the making of milk, while small human-looking characters demonstrate the chemical changes which take place in the various organs. Each function is labeled plainly to enlighten visitors on the milk-making procedure.



Displayed at Chicago Century of Progress Fair is this mechanical cow with cutaway innards demonstrating how milk is manufactured. Small figures illustrate chemical processes.

Heat on Neck Cures Sea-sickness

NECK heaters as a remedy for sea-sickness or air-sickness are suggested by a French scientist. The idea of the treatment is to heat by electric treatment the small bulb of nervous tissue called the medulla oblingata, inside the back of the neck just at the junction between the spinal cord and the brain. In tests employing a new medical process known as diathermy, sea-sickness, car-sickness, and air-sickness and all similar conditions were relieved at once.

Orphans Win Toy for Heroism

Orphan boys who saved lives of 500 people by preventing train wreck being presented with Lionel train for heroism.

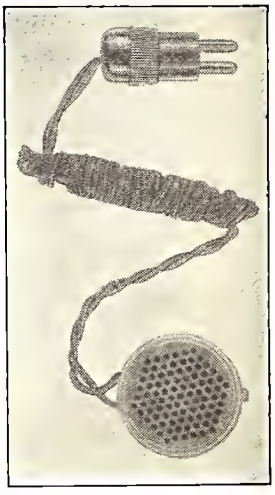
STUMBLING, struggling for breath through a terrific thunderstorm near Passiac, N.J., six orphan boys, waving, screaming desperately stopped an Erie train fifty feet from a washout and saved the lives of 500 passengers. The story of their heroism made front page news throughout the nation, and as a reward the boys won a railroad of their own. The road has three miniature trains like the one shown in the photo above, and is complete with tracks, switches, signals, miniature stations and other buildings to go along their railroad's right of way.

Copy Detective for Safe Driving

USEFUL applications of detective story technique to safe automobile driving are suggested by the National Safety Council. One instance is cited to illustrate the point. A bus driver who must have known his Sherlock Holmes was approaching a cross street when he suddenly slowed down for no apparent reason. Just as he reached the corner a speeding truck appeared from the side street, where it had been invisible. A collision was avoided. The bus driver explained that he had seen a pedestrian hurry to reach the curb and had deducted that some vehicle invisible to himself was approaching.

Lapel Mike Latest in Flexibility

A TINY microphone for use at banquets, conventions, etc., is only one and one-quarter inches in diameter and fastens securely to the coat lapel by a clip on the back. The mike, manufacturers claim, is so unobtrusive that the speaker forgets about it and makes a speech free of self-consciousness. It permits complete freedom of movement and expression and does not greatly interfere with sleepers.



Midget mike fastens on lapel with a small pencil clip.

1000 Ways to

Here again this month Modern Mechanix and Inventions sets forth a group of money-making ideas that have proved their practicability at the task of bringing in a depression income. Look the list over carefully—one particular item may suit your needs and conditions to a T.

Hot-Buttered-Corn-on-the-Cob-5c!

A young fellow, a real go-getter, attracted considerable attention (and coins) at a popular summer resort on the New Jersey coast. He had a portion of a boardwalk store for his place of business and was doing a better business than the store from which he had rented his small space. He ran a Hot-Buttered-Corn-on-the-Cob counter. He bought the corn from a farmer at a much lower price than he would have to pay at a retail grocery and sold it at 5c per cob. Over his stand he had a large attractive sign in red letters which read:

HOT BUTTERED CORN ON THE COB 5c

and people were buying the corn from him as fast as he could hand it out! The delicious aroma of the corn hung over the entire boardwalk and did all the selling job necessary!

Bees Net Good Income

A jobless Colorado man has made a good income during the depression by working with bees. Establishing an apiary near the city limits he sells bees, frames of brood, and queens, and teaches people, who want to help defray living expenses by having their own honey supply, how to care for bees. He cleverly places hives of bees on city premises, in garages, houses, and yards, where they will not be objectionable to neighbors. He drives through the rural district buying and selling bees, honey, wax and apiary equipment. During the dull season he helps other apiarists prepare bee supplies.

Delivery Service for Merchants

Realization that many grocery stores and meat markets had been forced to discontinue their individual delivery services enabled one enterprising man to acquire full time employment at good wages. He observed that these stores in effecting the economy of no delivery overhead had lost the trade of many people. Approaching the proprietors of a number of these stores he made them a proposition to deliver their orders twice a day at no cost to them, the small delivery charge of ten cents being paid direct by the customers who desired the special service. It did not require much persuasion to line up a goodly number of merchants. Large display cards were furnished the stores explaining the delivery service.

Ironboard Cover Holders

One man earns a good living making and selling holders for ironing board covers. He found that housewives were greatly appreciative of a device or gadget that would enable them to quickly change ironing board covers, or replace a scorched one. These holders he has found to be easy to make and they sell readily. Short lengths of No. 8 copper wire have their ends cut

Make a Living

slanting to form sharp points; the wires are then bent into V-shapes and the sharpened ends curved to form claws. A short length of light coil spring, attached between the two claws, completes one holder. A set of five holders sells for twenty-five cents and costs about three cents to make.

Ocean Floor Sight-seeing

A youngster in Florida who built a diving helmet from plans given in June Modern Mechanix and Inventions is earning a neat little income by conducting an underwater sightseeing agency on the end of a pier near a swimming beach. A sign stuck up on a post by his concession draws dozens of customers curious to see what the bottom of the ocean looks like. While the sightseer traipses around under the water, the concessionnaire mans the pump on the pier and looks after his customer's comfort and safety. 10 cents is charged for a 15 minute descent.

Shopping News for Merchants

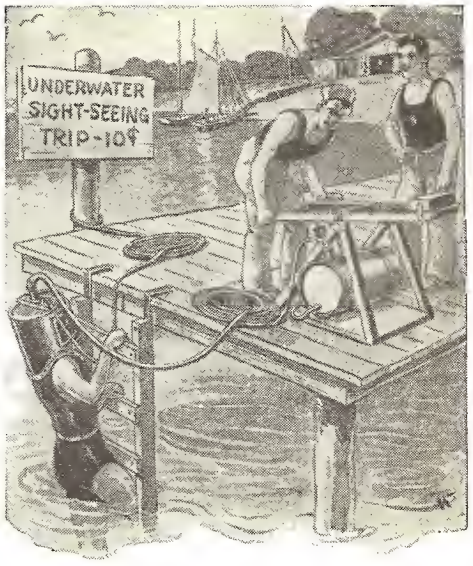
An elderly Buffalo business man who had lost his position struck upon this idea of making his living while reading the advertisements in a local newspaper. He decided to publish a weekly shopping news featuring all the large department stores of the city and advertise their sales for Friday and Saturday. He then solicited ads from these large stores at a great reduction from the advertising rate of the daily papers. The shopping news is published each Thursday and is distributed free to every family in the city. After the appearance of the first edition of his publication he was unable to take care of all the merchants who wanted ads placed in the new medium. This man is now making an enormous weekly income and has a whole staff of men working under him.

Hobby Pays Money

An unemployed man in New York has developed a living from his hobby. He had always been fascinated by tinkering with clocks. Shut out of his regular line of employment, he found that in almost every home there is a clock that either would not run, or else ran incorrectly. The average person will take his watch to the jeweler for repairs but it is very seldom that any one is found who relishes tucking a bulky clock under one arm and marching it down the street. Playing on this natural characteristic of people this former grocery store clerk is now making a very profitable living as a traveling clock repair man.

Money Cutting Glass Designs

With a small portable electric motor (1/6 to 1/12 h. p.), a flexible shaft and a glass cutting emery wheel, any workman who is a fair penman and at all artistically inclined, can, with a little practice, cut simple pattern and designs on glass ware. At first it



may be necessary to trace the designs on the glass but the most attractive work will be turned out when sufficient proficiency is attained to be able to work free-hand. With such an outfit jars and bottles may easily be converted into attractive cut-glass articles. Also one may buy plain vases wholesale and cut designs on them.

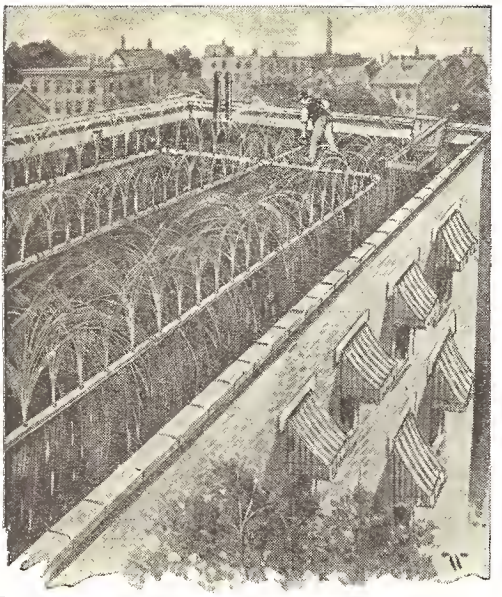
Mimeographing Advertising and Letters

Practically all kinds of businesses have occasion to send out letters advertising some new item or new prices as well as calling customers' attention to old accounts and informing their best patrons about style and price changes. This applies particularly to small concerns who do not have extensive advertising budgets and must make every advertising penny count to the utmost.

Mimeographs or other duplicating machines may be had on such easy terms these days that a very little amount of work will provide one with the necessary payments on the machine and a margin of profit that grows as work is solicited. Most establishments, especially the smaller ones appreciate a reliable man who contracts to handle this work.

Bug Chasing for a Profit

One man makes a good living by calling on people whose yards have nice attractive shrubbery, and offering to spray the plants periodically to rid them of the insects which are found on most plants. Many species of bug will kill the plants if not exterminated. A good tobacco powder can be bought at hardware stores for 25c per pound and when boiled in two gallons of water will spray several jobs. A good spray gun for hand use can be had at very low prices. After doing several jobs effectively this man has had no trouble in profitably using all his time. The charge is usually figured on a time basis—a $2 job netting about $1.50.



Plumber Uncovers Spare Dollars

A jobless plumber in Omaha has succeeded in earning a living for himself by showing apartment house owners how they can overcome loss of rentals on their top floor apartments during hot months—a problem which every apartment house owner knows only too well. His plan consists of laying perforated pipe on the roof so a fine and continuous spray can be thrown over the roof on hot days. The resulting evaporation causes a reduction in temperature of from 12 to 15 degrees throughout the top floor. The gain in satisfied renters during one summer offsets the cost several times over. This idea has been utilized very effectively by a large roadside restaurant in Los Angeles and a Santa Barbara hotel varied the idea by laying a pipe on the ground around the building through which a spray was shot up around the building on hot days.

Replacing Unsightly Aerials

The unsightly appearance of most of the radio aerials in his neighborhood gave one Detroit man an idea that has netted him many dollars since. Unattractive poles or aerial rods perched upon an otherwise beautiful home, can do much to detract from its appearance. This ambitious man agreed to remove these ungainly aerials and replace them with ones that circled the house in a protected, inconspicuous path underneath the eaves. A flat rate of five dollars was charged for the service of removing the old poles and wires and replacing them with the new type installation. Most of this sum was clear profit, as usually the old wires and insulators could be utilized.

Prospective customers were first approached and shown photos of homes before and after the new aerials were installed. Usually when the advantages of the new over the old were told—such as less danger from lightning, better reception in bad weather, better protection from high winds—a sale was made and another person was added to his waiting list of customers.

Ice Blankets for Sale!

In Montreal a young man has discovered that not every housekeeper can afford an electric refrigerator and has to keep to the old system of buying ice. To these people the young man demonstrates what he calls an Ice Blanket. This he has made out of a three-foot square of outing flannel which he dips in a good grade of paraffin oil and then runs it through an old clothes wringer. When he has removed all the oil he can he smoothes out the flannel squares and folds and seals each in a cellophane envelope along with some colored advertising matter which can be read through the wrapper and which also gives his name and address and phone number.

He guarantees that each Ice Blanket will save its cost in ten days' time if used according to the accompanying directions. The Ice Blanket, when placed around the cake of ice in the refrigerator, excludes all air and prevents such rapid melting, making two cakes of ice last as long as three or more ordinarily. These Ice Blankets cost him fifteen cents each complete with envelope and advertising matter and sell readily at fifty cents.

Tropical Fish Are Profitable

Tropical fish are quite unknown in most communities as yet although they have been raised successfully for many years. These little fish are easy to raise, low in price and sell fast. Simply procure several pairs, a few plants, a modest aquarium (which is easily constructed at home) and the fish will soon profitably multiply. There is an increasing market for the fish, as well as the plants and complete outfits. A more ambitious project, along the same line, is a tourist museum or glass enclosed rock garden. As a nucleus for such an old greenhouse is ideal and many are idle at low rent. The idea of a tropical garden can be sold to an enterprising greenhouse proprietor as an added attraction to his business. They never fail to interest young and old.

Use for Old Phonograph Records

Old phonograph records have for years constituted a challenge to the ingenuity of those trying to find a use for them. Here is a method that will profitably dispose of as many as you can buy, beg, steal or borrow! Take a two-quart pail, turn it upside down in a hot oven and on it place one of the old phonograph records, correctly centered. When the record becomes thoroughly heated, its over-lapping edge will turn or "mold" down over the upturned pail, and when cooled off you will have a very novel flower pot, complete even to the hole in the bottom! Using different shaped objects for "molds" under the records the finished jobs can be made to have a variety of shapes from the conventional flower pot shape to flat trays with shallow edges.

Whitewashing Trees

Whitewashing trees for neighbors nets a sizeable income for an unemployed man in Akron, Ohio. Only a small investment is required—sufficient to purchase a whitewash brush, a pail and a small quantity of the following materials: Unslaked lime, common salt, rice flour, Spanish whiting and glue. Most promising prospects will be found among people who are proud of the arboreal ornamentation of their lawns. A flat rate of 25 cents a tree will yield a neat profit.

Moving List Service

A young man, unable to find other work, created his own job, and has been paying his way by selling a "Moving List Service." Twice a week he secures from moving and transfer companies a list of the names and addresses of all the people who have moved, new people who have moved into the city, and the addresses to which they moved. From these he compiles a consolidated list, and runs off on a mimeograph as many as he requires for his customers, who are laundry drivers, milkmen, bakery men, coal men, ice men, cleaning establishments, grocery, meat and radio men. In short, any firm that depends upon selling their commodity or service regularly at the home, and so are always on the watch for new customers. Knowing the name of the newcomer before making the "approach" gives them an advantage over having to go "cold" to the new occupant. For the service he receives three dollars per year from each customer.

Home Town Cook Book

The home town cook book is a particularly good money making project and has been successfully worked in many localities. Recipes are contributed by as many local women as can be solicited and the promoter sells advertising space, the cost of which is based on advance estimates of the printing expense. A minimum circulation is guaranteed to the advertiser, and the printing is done on serviceable but not expensive paper.

It is customary to secure as many contributions as possible, each housewife giving her favorite recipe. To personalize the project, credit is given to the contributors. The books are usually sold at fifty cents each. The contributor naturally will purchase one or several of the books to see their names and recipes in print, and clubs, church societies and other women's organizations, when given a liberal commission (usually 50%) often sell hundreds of them.

Office Housecleaning

Business and professional men seldom consider the difference a good washing job will make in the appearance and atmosphere of their offices and surroundings. A former store clerk, with this idea in mind, called on several men and obtained the work of washing down the walls. Most business men welcome the suggestion, particularly as it can be done at a very reasonable expense. This clerk got the job of doing the work on a contract basis of three times a year, and already has a regular clientele. A small ladder, an ordinary bucket, a sponge and a can of paint cleaner is all the equipment that is needed. About ten cents for every twenty-five square feet of surface cleaned will net a neat sum from any job.

Containers for Newspapers

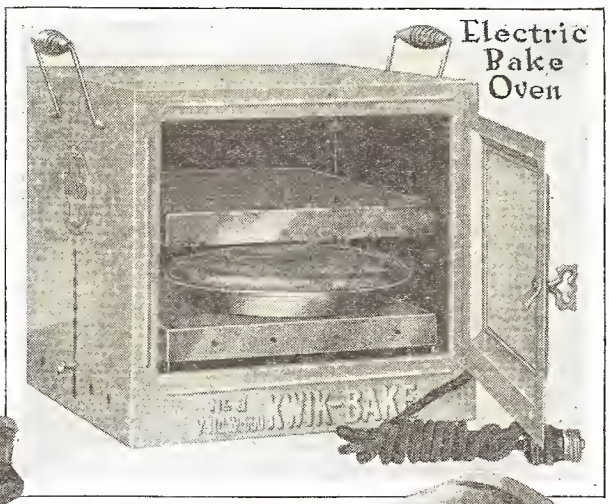
An enterprising newsboy has been making neat wooden boxes for receiving the daily paper. The box is dimensioned to take the folded paper and is just a bit longer than the width of the sheet. The papers are slipped through a slot in the end of the box, while some of the boxes have hinged tops. He carries a sample with him on his route and contracts to install one to a customer for fifty cents. This price includes painting it the color of the customer's house and attaching it at a conveniently designated place. The boxes keep out rain and snow and prevent papers from being blown away —thus insuring a neat and clean daily paper.

CASH FOR MONEY-MAKING IDEAS!

Have you worked out some ingenious, practical way of making money, either as a full-time job or a spare time activity? Perhaps some friend or neighbor, thrown out of work, has used his wits to devise some money-making scheme which brings better returns than the job he lost—this very thing has happened so often recently that many men look on depression as a blessing in disguise. For all accounts used in this money-making department of the magazine, payment will be made at regular rates. Contributions will not be returned unless postage is enclosed. Keep your article brief, and address it to Modern Mechanix and Inventions, 529 S. Seventh Street, Minneapolis, Minn.

New Inventions for

Motorized Cocktail Mixer



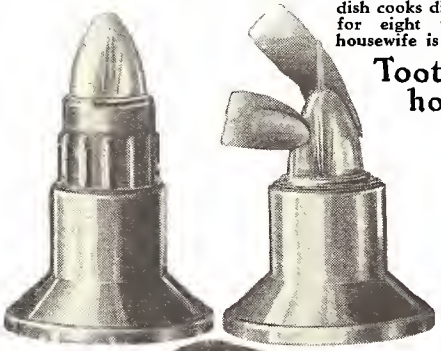
Motorized cocktail shaker at left makes vigorous shaking unnecessary. Right—Heat of new electric bake oven is applied evenly, elements being built into the shelves.

New handleless faucet permits the housewife to fill glass of water while holding tray of food in other hand. In place of the handle there is a stem which projects downward from valve seat and connects with a small rubber tired wheel. Right—Storage space of electric refrigerator is greatly increased by use of wire shelves which attach to the door. Food can easily be replaced or removed by this method.

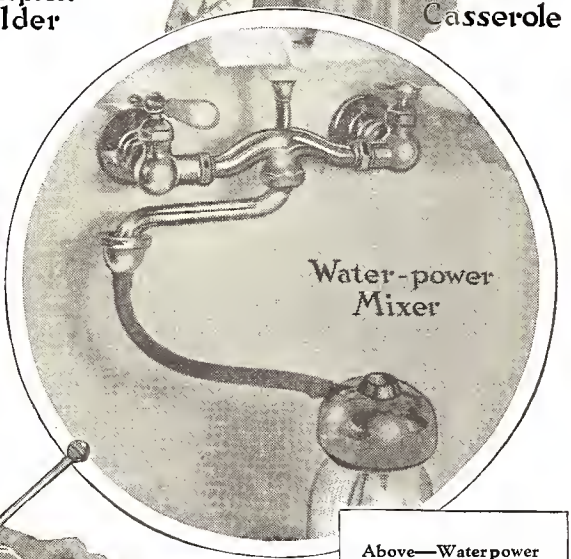
These tablets of pure silver in spongy state purify water, killing all dangerous germs.

Home Convenience

New deodorizer for ice box absorbs all odors, permitting diverse edibles to live in harmony. Right—Casserole dish cooks dinner for eight when housewife is out.



When slight pressure is applied to cone, this novel holder ejects a single toothpick through a small hole in the top.

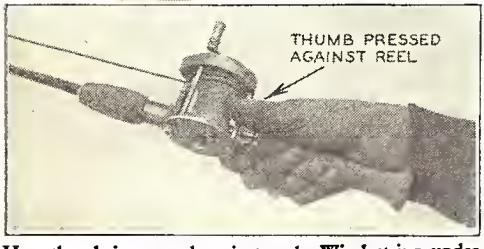


Above—Water power whipper mixes drink and cools or heats it as you prefer. Water driving the motor discharges over the jar. If you want a cold drink feed cold water into the hose; for hot drink, use hot water. The whipper fits any standard glass jar. Left—Weighing only 30 lbs., this portable ironer can be carried about easily and hung up on the back of door when not in use.

Improve Your Accuracy at Bait Casting

When casting take the stance illustrated here. Stand erect, with feet close together, left arm down, grasping the rod handle, reel up, with the right hand, and keeping the elbow close to the side. Hold the thumb firm against the reel to prevent the line from running out. Avoid bringing the rod up, or swinging it down sideways. Most action is performed with the wrist.

When cast is finished the rod will be slightly above the horizontal. Note that the rod play is confined to the quarter of an imaginary circle. Thumb is firm against reel at this position.



How thumb is pressed against reel. Wind string underneath to enlarge the diameter of the reel for thumbing.

ANY boy who has tossed an apple from the end of a stick, or beaten a rug, can easily learn how to master the art of bait casting. And who will gainsay the fact that bait casting is a more pleasurable diversion that such dismal and monotonous jobs as carpet beating, for instance.

Anglers who are skilled fly or bait casters invariably get more kick out of their sport than fishermen who use cruder methods. The secret is in the skill of placing the lure accurately in the spot desired, thirty, forty, or even a hundred feet away.

In bait casting the reel does most of the work; the rod is just a sort of stick, with line guides, to give leverage to the cast. Consequently, the reel should be a quadruple multiplying, 110-yard capacity, and preferably anti-backlash, level-winding device, made of good quality materials.

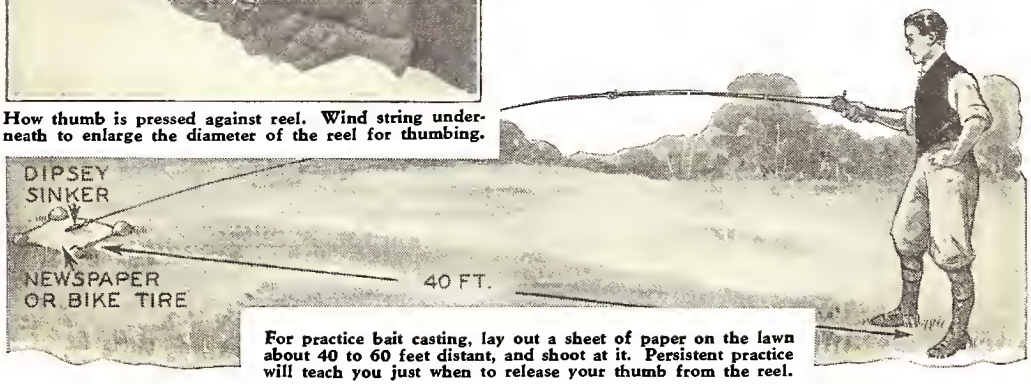
If the reel does not have a cork core, a discarded line (or 10c store twine) should be wound on the spool until it is half filled, in order to facilitate "thumbing." Then attach the braided silk line—12-lb test for a five-ounce rod; 18-lb. test for a six-ounce rod—looping the line around the spool and fastening.

Now to learn casting it is not necessary to go fishing. A lawn or city park will do for practicing. If practicing on a lawn, use a bicycle tire or a newspaper for a target; if on water, anything that will float. The target should be about forty feet away.

You should strive for accuracy in casting rather than for distance. Clamp the reel to the rod handle, thread the line through the guides, then attach the end of the line to the weight. A dipsey sinker will do in lieu of a tournament plug.

Now standing erect, with feet close together, left arm down, grasp the rod handle, reel up, with the right hand, and keeping the elbow close to the side, practice the wrist movement shown in the accompanying illustrations, holding the

(Continued on page 126)



For practice bait casting, lay out a sheet of paper on the lawn about 40 to 60 feet distant, and shoot at it. Persistent practice will teach you just when to release your thumb from the reel.

Prize AWARDS in Gyroscope Cover $50 CONTEST

The best letter in our June Cover Contest in answer to the question "Can This Man Fall?" was submitted by Emmett Healey, of Delano, California, who wins first prize of $15 with his clear, terse summary. Balance of awards, together with illustrative letters, are listed below.

A FLOOD of letters from all over the world proclaimed intense interest in our June Cover Contest, wherein $50 has been awarded, $15 to the winner, $5 for the five best letters, and $2 for the next best five explanations.

Emmett Healey, of Delano, California, submitted the most terse, clear, and accurate synopsis in answer to the contest question, "Can This Man Fall?"

The cover depicted a tight rope walker on the high wire, supposedly kept in perfect balance by a double gyroscope carried at right angles to his line of march.

Winners of $5 awards were W. G. Ernst, U. S. Naval Air Station, Norfolk, Va., Homer Baldwin, of Columbus, S. C., E. B. Norman, of Monrovia, Cal., A. C. Thurman, of Richmond, Cal., and Earl R. Martin, of Urbana, Illinois.

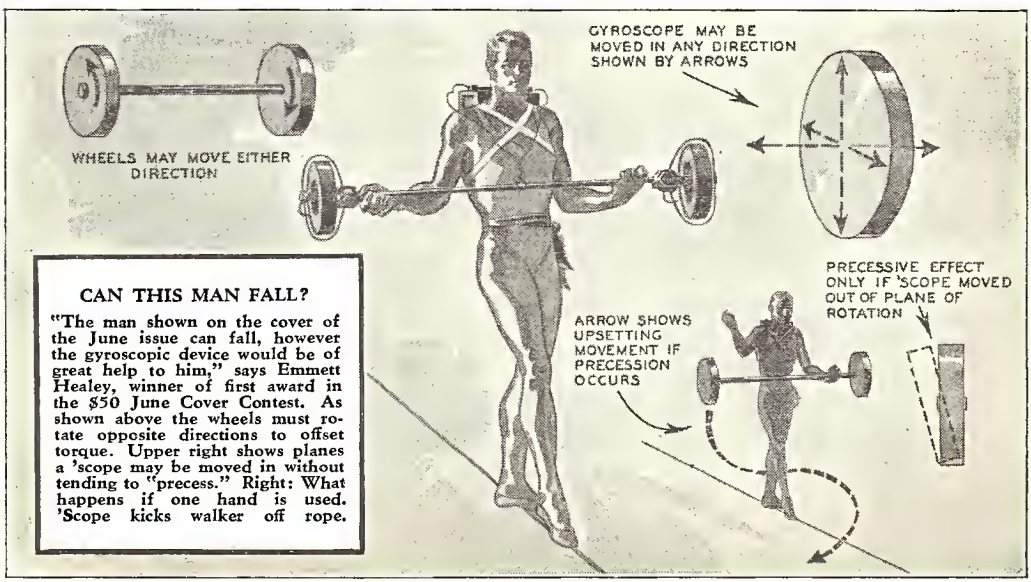
Winners of $2 awards were Andrew Vena, New York City, Garen Roush, Letart Falls, O., Burton K. Patton, Brooklyn, N. Y., Jesse Harris, Richmond Hill, N. Y., and C. J. Armstrong, Houston, Texas.

The substance of most of the letters was that the gyroscopes would keep the aerialist from falling, which opinion is in error.

The letters awarded prizes all were correct in saying that the 'scopes could not prevent the man's falling, as nothing yet has been discovered which will refute the power of gravity. Once off the rope for any reason, the man would fall like a plummet. The gyroscopes, however, will greatly aid such a stunt, and would enable a man to traverse dizzy heights with much more safety than is now gained with the well known pole, or umbrella.

The point most were unanimous on was that the wheels should rotate in the same direction. Mr. Healey contends that they should be in opposite rotation to minimize torque and to complement precession. This is true, but as far as the actual precessing is concerned the judges were of the opinion that the wheels might rotate in the same direction, or opposite directions. A model was made to prove the point. A gyroscope will not precess as long as the wheels are moved in their plane of rotation—that is parallel to the face of the wheel. This means the aerialist can move forward, back-

(Continued on page 25)

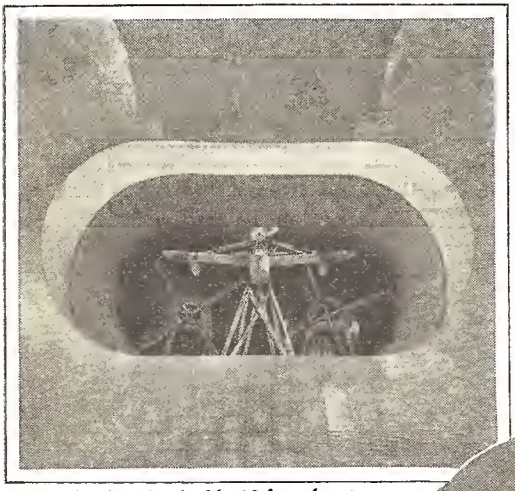

GYROSCOPE MAY BE MOVED IN ANY DIRECTION SHOWN BY ARROWS
WHEELS MAY MOVE EITHER DIRECTION
PRECESSIVE EFFECT ONLY IF 'SCOPE MOVED OUT OF PLANE OF ROTATION
ARROW SHOWS UPSETTING MOVEMENT IF PRECESSION OCCURS
CAN THIS MAN FALL?
"The man shown on the cover of the June issue can fall, however the gyroscopic device would be of great help to him," says Emmett Healey, winner of first award in the $50 June Cover Contest. As shown above the wheels must rotate opposite directions to offset torque. Upper right shows planes a 'scope may be moved in without tending to "precess." Right: What happens if one hand is used. 'Scope kicks walker off rope.

Putting PLANES Through

Light Plane Fans, Attend Ye! Here's the inside story of the N.A.C.A. Laboratory by an Air Service lieutenant who knows what he is talking about. Lieut. McDarment lists developments now under way in this ultra modern design laboratory, which is so huge it has a wind tunnel capable of wind-testing full size airplanes!

A NOISE which began like the low rumble of an earthquake gradually swelled in tone until the whole atmosphere over the Langley air field trembled with the vibration.

"What's that unearthly howl?" asked a visitor of an aviator who was guiding him around the big Virginia air base.



A view showing the double 18-foot throat with a full sized flying boat on the dynamometric balance, readv for tests.

"That," replied the aviator, "is an airplane being put through the third degree on the operating table of the giant wind tunnel of the N.A.C.A. They test the strength —or weakness—of planes there."

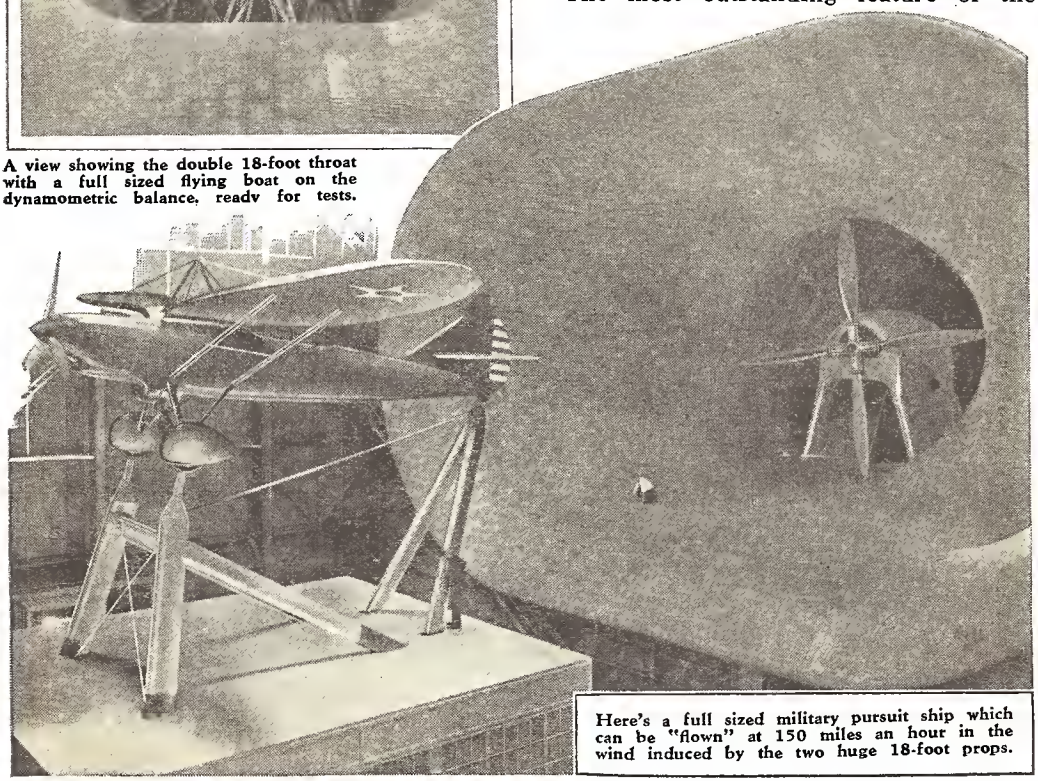
"Are visitors allowed in this—this N.A.C.A.?"

"That's short for National Advisory Committee for Aeronautics," the aviator explained, "and visitors are allowed, but most of the work there is of a confidential or secret nature until finished."

Largest Wind Tunnel in World

And what the aviator said is true. Here in this fairly secluded section of Virginia is the most important aeronautical laboratory in the world and the work is mostly secret or confidential. The "big shots" of aviation compose this aeronautical committee. They live all over the country. But the real engineering research work is done by skilled civilian technicians at the laboratory.

The most outstanding feature of the



Here's a full sized military pursuit ship which can be "flown" at 150 miles an hour in the wind induced by the two huge 18-foot props.

the Third Degree

by Lieut. Corley McDarment

laboratory buildings is the giant wind tunnel—the largest in the world. Into the huge mouth of this tunnel whole life sized airplanes may be stuffed, and when the four thousand horse power motors begin to spin the eighteen foot propellers, a roar is set up like distant thunder or an approaching earthquake. And an airplane takes a beating.

Gales Test Strength

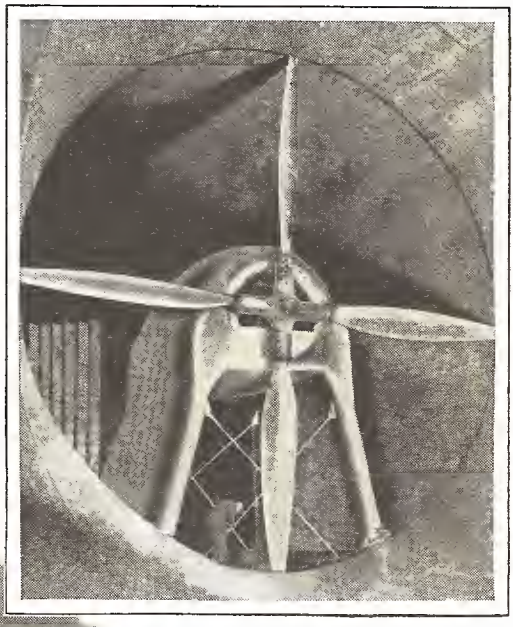
The airplane is securely tied down in front of the maw of the great tunnel while a blast of air with a velocity of 150 miles an hour lashes its wings, elevators and ailerons. Unless the plane is pretty strong pieces will be torn off like a western cyclone strips the feathers from a chicken. A man cannot stand up in such a gale. If he were propped up in it his clothes would be torn off, his eyelids puffed up like little balloons and he might literally drown in air. Aviators of course attain speeds much greater than this, but they are protected by goggles and shields.

The object of this wind tunnel and the other interesting test appliances at the laboratory is to get the "low down" in cold mathematical figures of all aeronautical equipment. The Government wants to know the breaking point of metals, the stalling point of certain planes, the flash point of oils and fuel, and a lot of other things that a layman would never think about. Whenever a plane manufacturer declares: "I've built the best plane in the world and I'd like to sell a batch of them to the Government," the officials may reply:

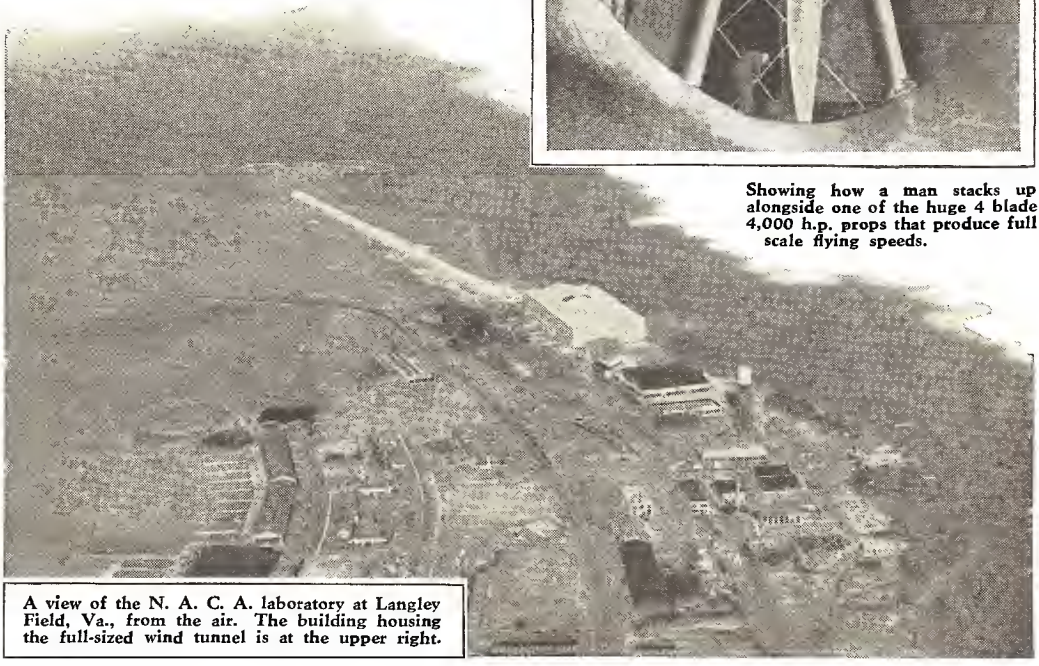
"That's fine, we'll take a sample plane and give it the third degree in the N.A.C.A. wind tunnel and get the figures on it."

And into the tunnel will the new plane go. It will not be merely set up into flying position and gently kissed with a breeze, but will be blasted with full force backwards, sideways, and upside down. If the plane has any "rheumatic" joints they show up.

When a plane is trussed up for the tunnel it goes like a patient to an operating table. Little instruments are stuck all around over it, but instead of testing heart, liver, lungs, grunts and groans as doctors do a human patient, the instruments show the

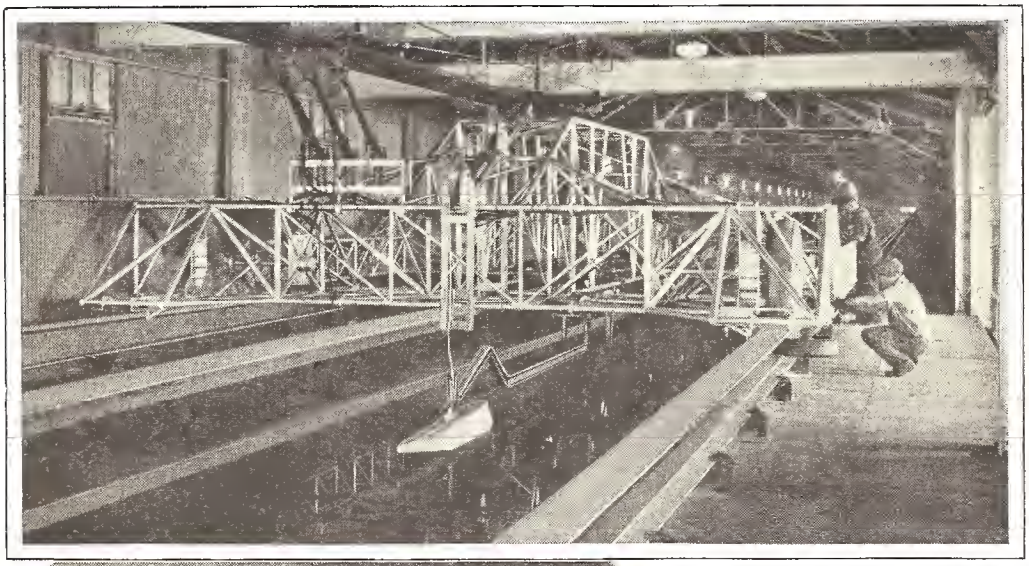


Showing how a man stacks up alongside one of the huge 4 blade 4,000 h.p. props that produce full scale flying speeds.

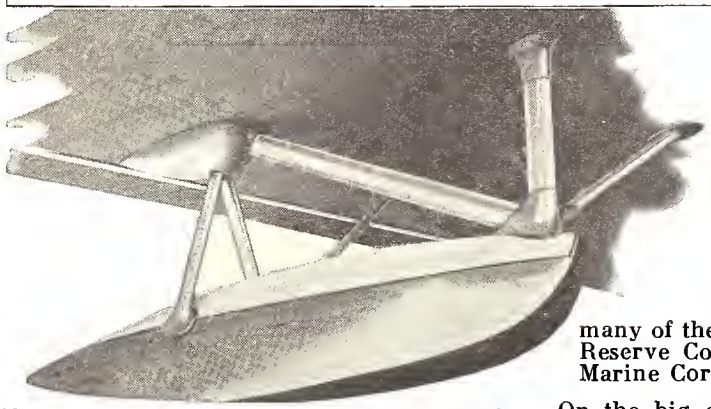


A view of the N. A. C. A. laboratory at Langley Field, Va., from the air. The building housing the full-sized wind tunnel is at the upper right.

Elaborate Towing Carriage Is the Only Route to Accurate Hull Design



Overhead trolleys and light weight steel tube construction feature the design of the Langley Field towing tank carriage.



No element of airplane design is so occult as the design of the floating elements of a seaplane or flying boat. A two thousand foot runway filled with water is equipped with an automatic electric light weight carriage capable of recording planing efficiencies by actually testing the models to be designed. Above is a seaplane float rigged for testing.

twists, turns, strains, bends and breakage or stalls of the plane. Sometimes a plane is found to be afflicted with high stalling speed instead of high blood pressure as with a human patient.

Aviation's Best Minds on Committee

Many of the internal "ailments" of a plane do not show up readily to the eye during the strenuous diagnosis in the tunnel. Some of the minute fractures, tears or metal fatigue will be found in later microscopic examinations. These are the things which sometimes give way in the air when an acrobatic flyer least expects. The laboratory shows up all these little things and written reports are furnished to the people who need and are entitled to know them. The data is dished out in hard, cold, scientific figures and statements.

The men who diagnose the ills of airplanes and motors in the big Government laboratory are highly educated and skilled technicians. Some of them are Doctors of Science and several others have a string of college degrees after their names a mile long. The technicians are civilians but many of them hold commissions in the Reserve Corps of the Army, Navy or Marine Corps.

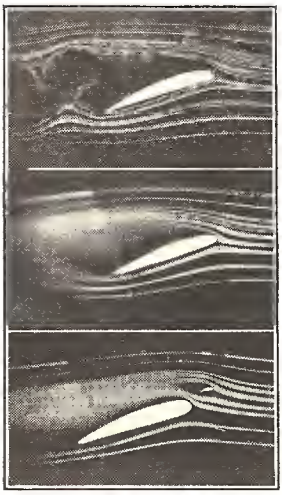
On the big committee which rules the laboratory are such names as Dr. Ames, President of Johns Hopkins University, Dr. Abbot, Secretary of Smithsonian Institution, Dr. Durand of Stanford University, Col. Charles A. Lindbergh, General B. D. Foulois, Chief of the Army Air Corps, Orville Wright, E. P. Warner and Gen. H. C. Pratt.

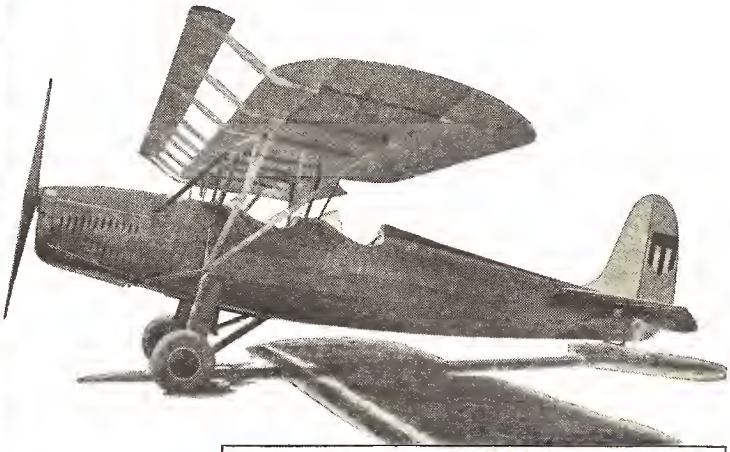
An aura of higher mathematics pervades the offices of the technical men in the big brick laboratory building at Langley. Desks are covered with blueprints, graphs, logarithm tables and ponderable looking formulas, resembling Einstein's theory of relativity. In fact one of the experts recently in figuring out the strength of a hollow tube used three dimensionless variables tied in with the mathematical law of Least Squares.

Actual Flying Done, Too

A steady amount of actual flying goes on in connection with the N.A.C.A. laboratory tests. But the mathematical boys do not go out and put planes through their paces in the air. Maybe they are too good at figuring percentage to take up actual flying. The

Smoke Photos Show Remarkable Effect of Slots on High-Climb Planes





At high angles of incidence (high climb near the stalling point) the air tends to break away as the above test photos show. By putting an auxiliary wing ahead of the main plane, the air is kept from burbling and thus stalling points are raised. A plane can climb better with slots.

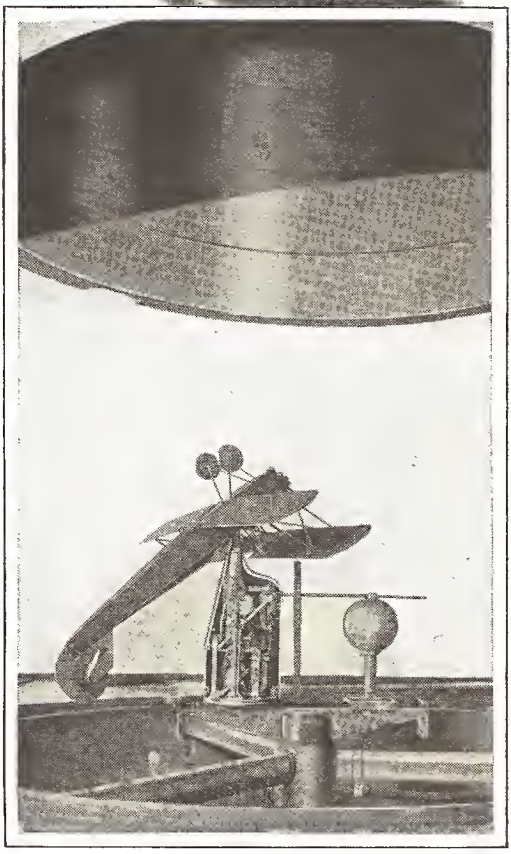
men who do the flying are not dumb but they would not take any first prizes in higher mathematics. It is often said that a mathematician would not make a good aviator because he might start pondering over coefficients and variables in the air and forget to work the ailerons and elevators of his plane.

The actual flying supplements the work of the big wind tunnel. It also helps give a practical side to some of the findings of the technicians. One of the laboratory men will make a discovery with his formulas and the new idea may be tried out on a plane in the air. For example, the landing speed of a plane with a certain wing curvature and load figures out to be a definite speed. A wing of that sort may be put on a plane and a test made. The reaction of certain shaped control surfaces is also tested against the laboratory figures.

Frying Pan Gadgets

The Army aviators at Langley Field are accustomed to seeing airplanes of queer shapes and sounds arise from the N.A.C.A. hangar and sail into the air. Planes with slots and flaps on the wings, also "spoilers" are a common sight as well as an autogiro hovering with no forward motion over the field. Sometimes an airplane may be seen flying along over the N.A.C.A. area with an apparatus that looks like a frying skillet on the end of a clothes line dangling below the fuselage. But a closer inspection will reveal it to be an instrument recording some peculiar movement of the airplane.

Anything new in the aeronautical world may be tested at the N.A.C.A. laboratories but the work is not all confined to the new developments. Old, tried and tested principles have come in for a share of suspicion under some of the new findings in the scientific world, and the laboratories



The special apparatus immediately above is a device for testing planes in spinning condition. The dynamometer records all forces and gives an accurate picture of stability characteristics, something no test pilot could do.

are equipped to tackle these to see just how much water they hold.

The newly announced paddle wheel airplane—a plane having big paddle wheels for wings has been under study at the

(Continued on page 130)

Walking Stick Unfolds Into Picnicker's Dining Table

Six wire shelves unfold from straight section of stick to form lunch counter, the end being thrust down in the ground as shown. When lunch is finished, fold up and strike camp.

IDEAL for campers, picnickers and hikers is a new utensil now on the market which provides the facilities of a walking stick and dining table. Six dishes of food can be laid out on the six shelves, which unfold from the straight section of the device. When you wish to pitch camp, simply jab the point into the ground and unfold.

Oil Tank Has Scientific Shape

AN EIGHTY thousand barrel oil tank, now in operation at Longview, Texas, has a shape which closely resembles a drop of mercury on a flat surface.

Since the drop of mercury does not collapse and the surface tension is everywhere the same, it follows that the shape of the drop must be such as to conform to these equal tensions. This tank, shaped exactly like a drop of mercury, has the weight distributed equally over the entire surface.

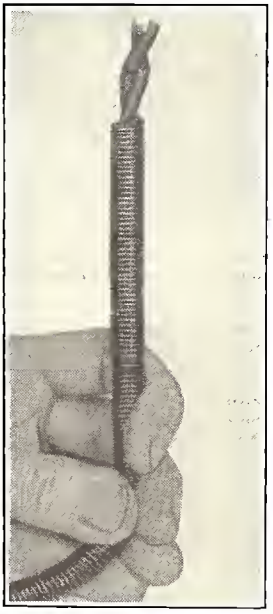
The structure weighs five hundred thousand pounds, or about sixty thousand less than a standard tank of the same capacity. It was the first tank of its size to be welded.

Flexible Conduit From Door Spring

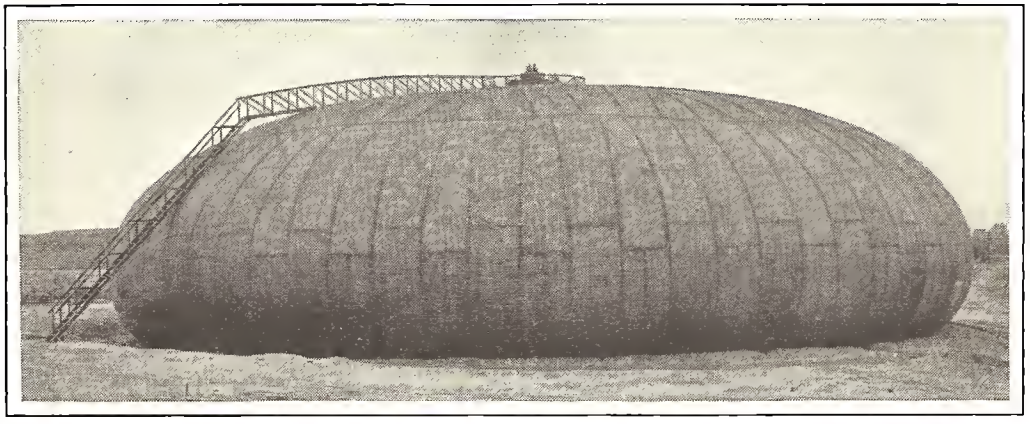
IN MAKING a repair on a washing machine recently, the writer was called upon to find some sort of a flexible conduit that would not only protect the cord from twisting but in some measure also from the water.

Ordinary conduit was too stiff for the purpose and funds were not available for the more expensive nickel-plated material. So it was found that a ten cent screen door spring was just right. To use such an article for this purpose, it is first necessary to clip off both ends. It is then only necessary to push the cord through. If it is desired to prevent the spring covering from slipping out of place, friction tape may be used.

Sharp bends and consequent breakage of insulation is prevented by the spring sheathing.



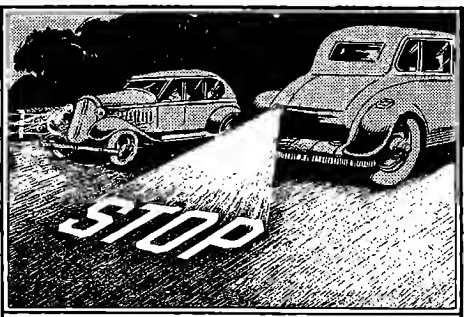
No danger of wire breaking when it is sheathed in old door spring and taped at ends.



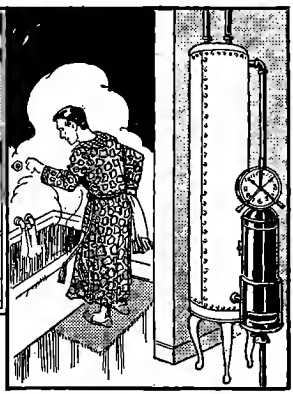
Shaped like drop of mercury, this oil tank has weight distributed evenly over entire surface. Structure is welded throughout.

Fortunes Waiting for Inventors

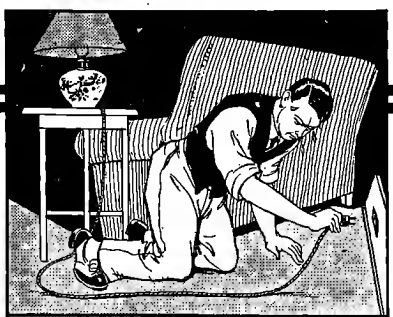
Restaurants, drug stores, etc., need a high speed banana peeler which will save time and labor.



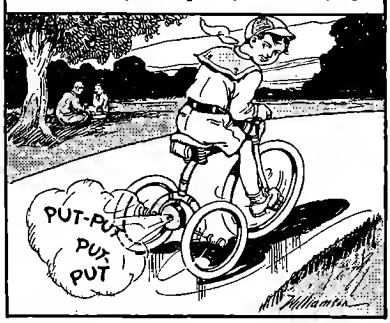
A young fortune is waiting for the inventor who will devise a safety light which will project a huge "stop" sign on the street in rear of car, as shown.



Wanted for the home—a timer for the heater that will start the boiler at any desired time of day.



Electric outlets now in use are responsible for a lot of discomfort. There's need for an easily and quickly inserted plug.



Toys often yield a fortune—a put-put-putter for a velocipede will bring handsome rewards.

Editor's note: Questions of readers desiring advice on how to secure patents, on methods of procedure, or on ideas for inventions, will be answered when such requests are accompanied by a stamped, self-addressed envelope. Never send models as they cannot be accepted. Address inquiries to Patent Editor, Modern Mechanix and Inventions, 529 South 7th St., Minneapolis, Minn.

EVERY day brings new evidence to the fact there has never been a time in human history that has been more advantageous to the inventor. There are in America today at least 20,000 manufacturers looking for new ideas; little ideas that will bring greater activity and greater profits to their plants.

Who then is going to be the lucky man who will perfect a little anti-slip device that can be *easily* attached to the shoe to be worn on icy pavements? The device should not cost more than five cents for each shoe and it should not in any way damage the sole.

Conservative estimates prove that we have a potential market for 4,000,000 automatic time-controlled valves for home gas hot water heaters. By this is meant a little alarm-clock controlled valve that will permit the gas burner to remain lighted just so many minutes and then extinguish it.

Thus when a member of the family wishes to take a bath, the heater is lit and set to turn itself off within a half or three-quarters of an hour. If such a thing could be made to sell for about $2.00 including the clock, the inventor would make himself $100,000 a year in royalties.

Who would stop to think that a fortune might be made with bananas? What is needed is a device for peeling bananas in hotels, restaurants and soda fountains. It should be something through which the bananas are merely pushed and they should come out, completely peeled, on the other side; an operation not consuming over 3 seconds of time. Such a thing could be easily worth $50,000 cash.

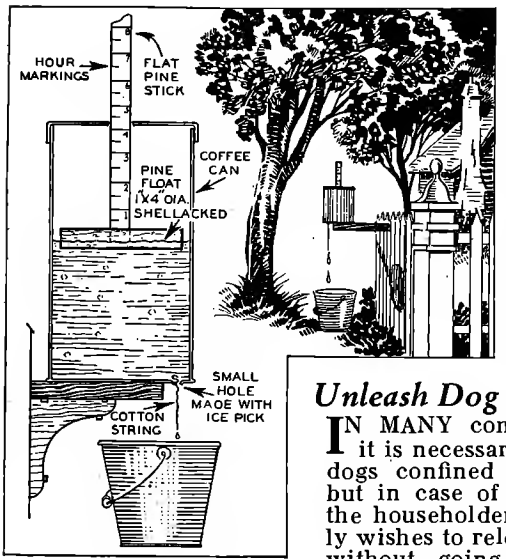
Milady's toilet is badly in need of a new accessory; not exactly a new accessory but an old accessory in new form. The perfume and toilet water atomizers now used have as their active and main principle a small rubber bulb which is squeezed to bring about atomization. The action of the alcohol in the perfume and the toilet water is very bad on this rubber and it soon becomes dull and hard, finally breaking. What is wanted is an all-glass and metal atomizer without a rubber bulb. To the man who has enough artistic taste and mechanical ingenuity to improve this little device will go a large fortune.

Every year there is used in the United

(Continued on page 134)

HANDIKINKS

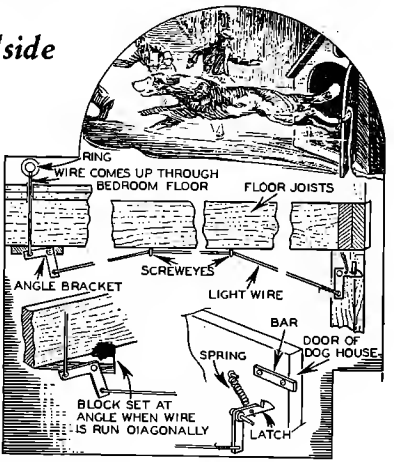
Do you know any short-cuts or handikinks which readers of these pages would find valuable? Send your ideas in to the magazine; if they are new and novel you'll receive a check in payment at regular rates.



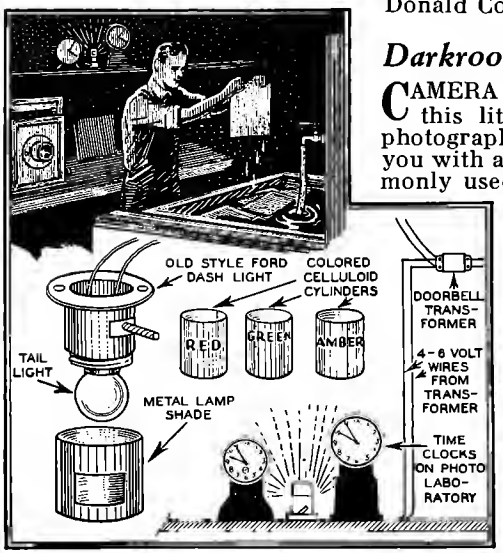
Water Clock Tells Correct Time

THE simplest form of time-piece, outside the sun dial, is this modification of the ancient water clock. All that is required are a coffee can, float and a graduated bar. How these parts are assembled is illustrated in the accompanying drawing. For the flat bar, a section of pine yard-stick can be sandpapered clean. Be sure the stick slides freely in the slot in the lid. To calibrate the clock fill the can with water and at the end of each hour mark the stick. Graduations will not be evenly spaced because when full the water drips faster than when nearly empty.—Hi Sibley.

Unleash Dog From Bedside



IN MANY communities it is necessary to keep dogs confined at night, but in case of prowlers the householder earnestly wishes to release them without going out. So here's an extremely simple unlatching device that works out beautifully. It is operated from the bedside, for a distance up to 100 feet. First drill a small hole in the floor near the bed and baseboard, taking care to locate it within an inch or so of a floor joist. Under this hole install an angle bracket as shown, so that wire will not need to turn a corner, and string under house through screweyes to the floor joists. At the other end connect to a latch on the door to be opened. The dogs will lose no time getting out.—Donald Cooke.

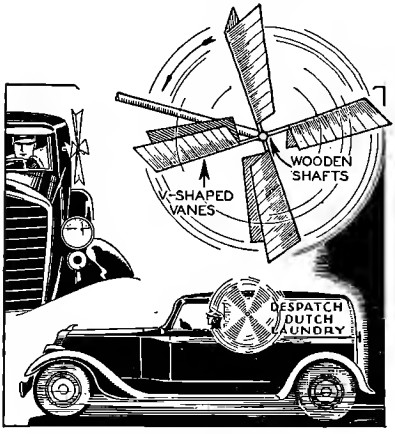


Darkroom Clock Light Operates on Six Volts

CAMERA fans will be quick to perceive the value of this little dark-room light which illuminates the photographic timing clock. Any junk yard will furnish you with an old-style hooded dash light such as is commonly used on old Model T Ford cars. To the socket attach a couple of wires from the door bell transformer, then mount the socket on a shelf so that it throws a shaded beam of light on your timing clocks. To render this white light non-actinic upon photo printing papers, plates and films, procure several pieces of heavy sheet celluloid—one red for ordinary plates, one green for panchromatic negatives, and one amber for printing papers. These strips of colored celluloid are then cut to size, wound and glued in cylindrical form to fit inside the metal shade of the dash light. The result is a subdued red, green, or amber non-actinic light inexpensive to operate. With white bulbs they can be used for many lighting purposes.—John E. Hogg.

Clothes Hangers for Closet Tops

THE upper portion of high-ceiling closets is usually wasted space. A good way to make this region available for use is to install a clothes pole near the ceiling of the closet in addition to the regular one lower down. Then by fastening a short pole (broom-handle) onto ordinary garment hangers, clothes can be almost as readily hung up and taken down from the upper pole as from the lower one. The upper part is, of course, specially useful for hanging unseasonable or seldom-used clothing. If the hangers have cross-bars for hanging skirts or trousers, set the pole handle at an angle so as to leave clearance between it and the bar. Consult the drawing at the right for details.—James Thomas.

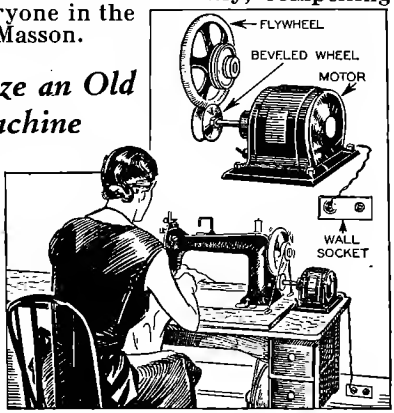


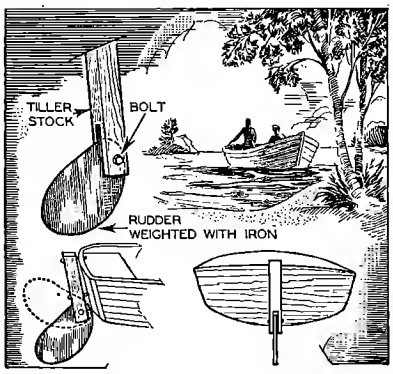
Novel Display Signs for Delivery Trucks

ANIMATED objects always catch the eye, and hence this little display sign for delivery trucks, involving as it does the use of a couple of rotating vanes, should get a lot of attention. On each side of the body of the truck is painted a large Dutch wind mill, and through the head of the mills is passed a shaft. Then to the ends of this shaft are attached a couple of vanes as illustrated at left. As the car speeds along, the vanes twirl furiously, compelling attention from everyone in the vicinity.—Elbert Masson.

How to Motorize an Old Sewing Machine

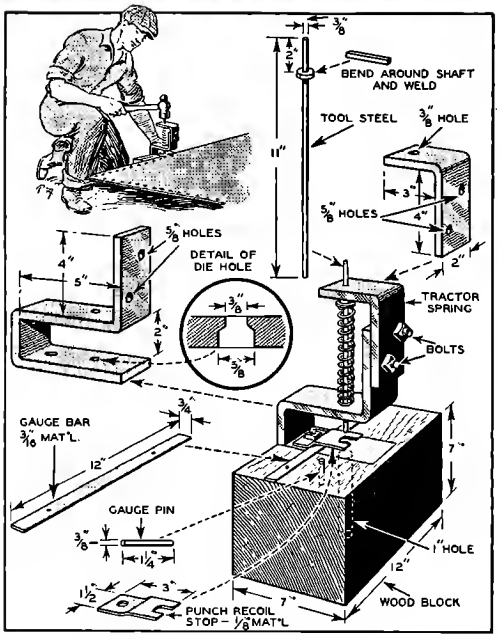
HOUSEWIVES will be glad to learn that an old-type sewing machine can be motorized for a few dollars. The drawing at right shows how it may be done. A small beveled wheel and a fractional horsepower motor, preferably a fan motor, constitute the needed materials. The beveled wheel is secured to the shaft of the motor, which is then mounted in such a position that the wheel rotates against the flywheel of the sewing machine. A foot rheostat will have to be inserted in the line to govern the speed of the machine. Any sewing machine shop will sell you such a rheostat.—Chester Sullivan.





Feathering Rudder for Shallow Draft Boats

THE rudder of shallow water boats generally gives a lot of trouble, but this can be eliminated by the use of the self-feathering steering apparatus illustrated at the left. When you beach the board or strike a bar, the rudder automatically folds up and thus keeps out of harm's way. First step in contriving the self-feathering rudder is to slot the tiller post. Then between the two cheeks pin the rudder, which is finally weighted with a piece of iron to keep it down when not reefed. This arrangement is ideal for rowboats and small motorboats. With it you can navigate any kind of water and forget the rudder. A good coat of paint will make a lasting job.—Erich Bluss.



Hammer Die Punch for Workshop

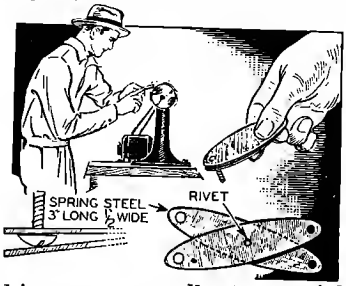
A CLEAN-CUT hole may be punched through 3-16 in. iron, gaskets, shims, inner tubing, etc., with this easily constructed punch. The materials required can usually be found around the garage or farm shop.

The bottom part of the frame should be made of steel capable of taking a temper, as it contains the die hole. The shaping can be accomplished by clamping the heated material in the vise and turning the bends with a hammer. After drilling the die hole in the bottom, place the piece in the forge and bank the fire so most of the heat will come through the die hole. Heat till material around the hole is a bright cherry red, then quench in cold water.

The punch is made from tool steel tempered as explained above. The ring should be welded onto the punch in the customary manner. It is cut from punch material squared up, 1½ in. long. See that the lower end of the punch fits in the die hole without binding. The spring is a heavy tractor valve spring 5 in. long. Note that the gauge pin permits punching equidistant holes.—Earle M. Dorris.

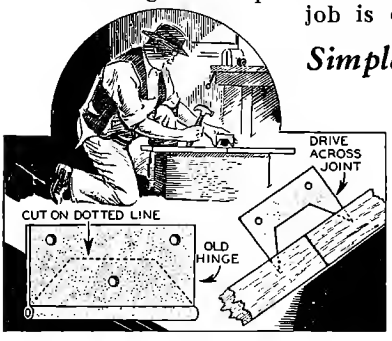
Grinding Short Screws Is Easy With Holder

ILLUSTRATED at the right is a little holder which makes the filing of short screws easy. A piece of wide corset stay or a strip of steel box-binding tape will do for material. The holder shown is drilled with Nos. 9, 18, 27 and 31 wire drills to take Nos. 10, 8, 6 and 4 machine screws. Fingers are protected and a better all around job is done.—Walter Brixius.



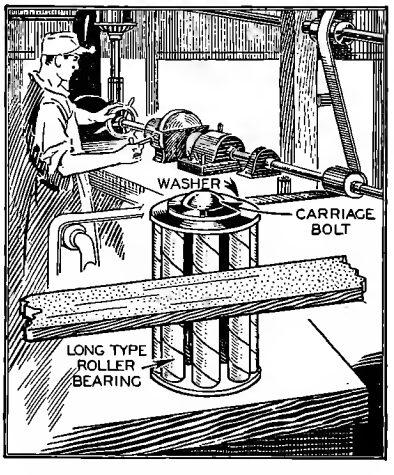
Simple Clamp for Gluing

THE butts of cast-off hinges are excellent material for the making of dog clamps. How they should be shaped is illustrated in the accompanying drawing. Note that the slanted sides of the clamp are driven in across the joint to hold the ends firmly together. Plastic wood will plug the holes left. It's advisable to drive clamps in on the underside where holes will be inconspicuous. — Weston Farmer.

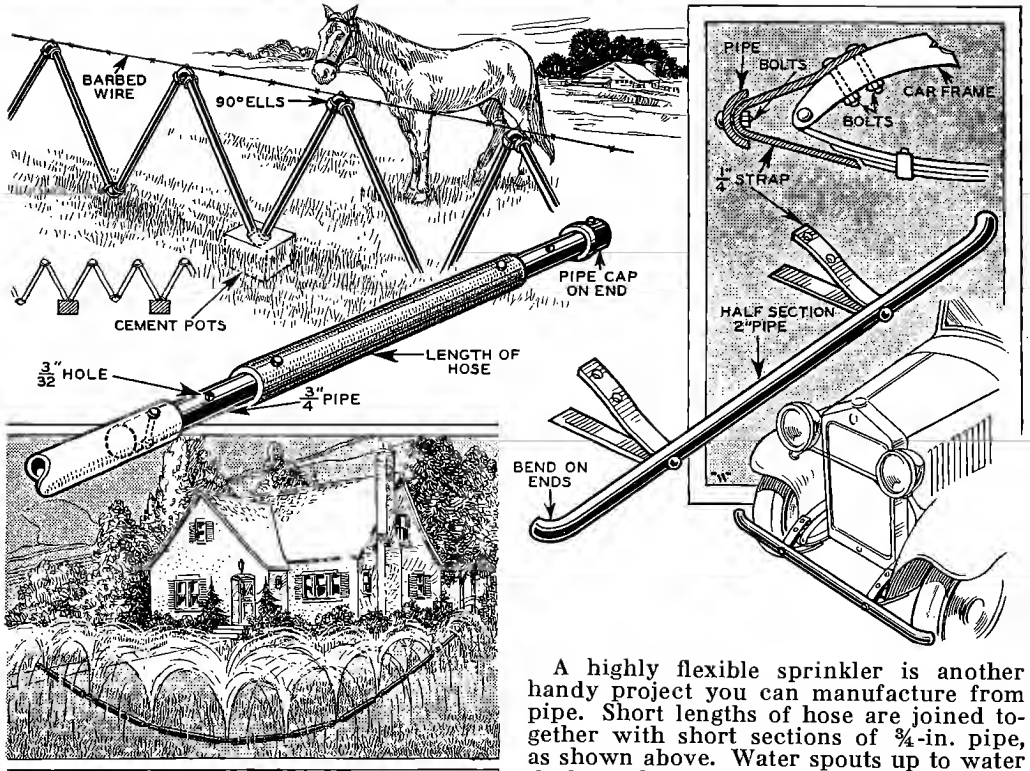


Belt Guide from Long Type Roller Bearings

OLD roller bearings of the long type make excellent belt guides when the bearing sleeves are left in them and they are mounted as illustrated in the drawing at the right. Long carriage bolts secured at right angles to the belt, leaving one-half inch clearance, will do nicely for mounting pins. A large washer on each end of the sleeve will retain the bearing and permit free turning when the guide is bolted to the support. These guides should be set up near pulleys on which there is danger of slippage. Another point is midway between two pulleys spaced an unusually long distance apart, where the belt wobbles considerably.—Wallace H. McClay.



Novel Uses for Pipe Odds and Ends

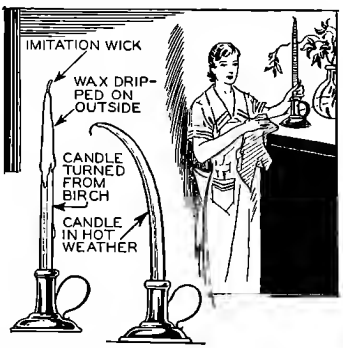


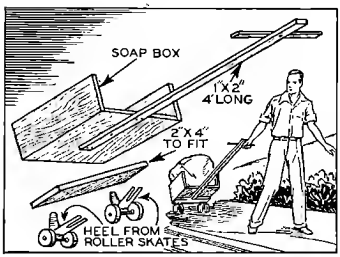
A highly flexible sprinkler is another handy project you can manufacture from pipe. Short lengths of hose are joined together with short sections of ¾-in. pipe, as shown above. Water spouts up to water the lawn through small pinholes in the pipe. The chief advantage of this sprinkler is that it can be laid snake-fashion around on the lawn. A 2-in. pipe sliced in half with a hack saw makes a surprisingly sturdy bumper. The accompanying drawing gives all necessary details. The pipe should be mounted on the car frame with ¼-in. strap iron. Note that the ends are bent to take away the sharp edges.—Weston Farmer.

UNUSED and rusting pieces of pipe lying around in your basement workshop or garage can be pressed into service as useful members of society. A sturdy hedge fence to shut in cattle and keep out trespassers can be made out of miscellaneous lengths of inch pipe connected by 90 degree ells, forming a saw-tooth fence as illustrated above.

Imitation Candles Won't Melt in Hot Weather

HOUSEWIVES who have candles on the buffet or dining table as decorative center pieces can eliminate one hot weather worry by making substitute tapers of wood as illustrated in the drawing at the right. It is a simple matter to turn a birch candle in wood according to the calipered dimensions of the original. A piece of wool fluff at the tip will make it look authentic, and real candle wax can be dripped around the top to complete the realism.—Dexter Masson.



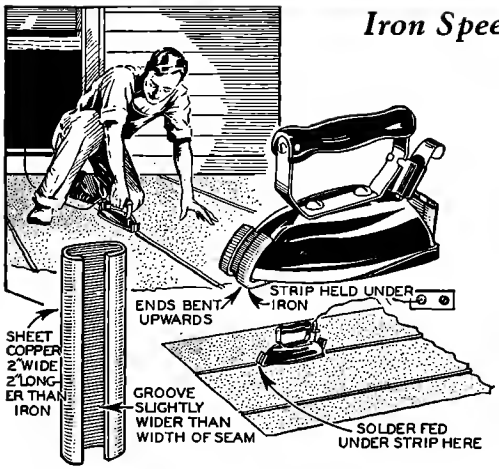


Wagon Saves on Ice

HERE'S a little chaser built from workshop odds and ends that proves ideal for transporting ice home from cash and carry ice houses. The body is merely a portion of an old soap box, while the wheels are the front and rear sections of a roller skate. A 1x2 about 4 ft. long does duty as a handle. A cake of ice fits snugly in the box and can be carried home with a minimum of loss from melting.—George Norberg.

Helpful Kinks for Handymen

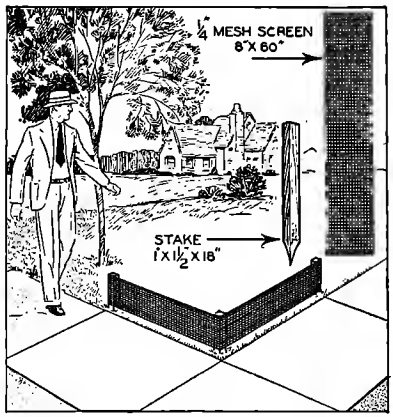
Iron Speeds Soldering Seams on Large Work

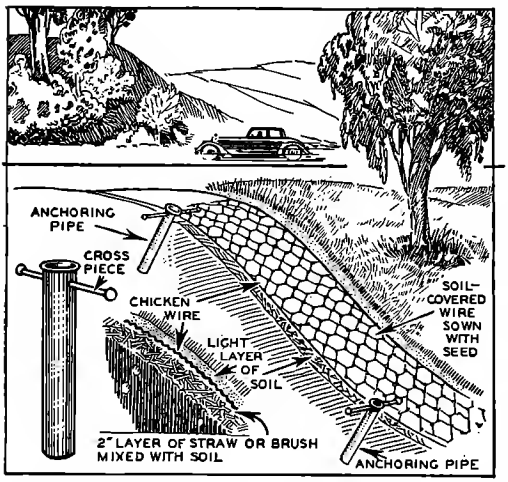

ENDS BENT UPWARDS
STRIP HELD UNDER IRON
SHEET COPPER 2" WIDE 2" LONGER THAN IRON
GROOVE SLIGHTLY WIDER THAN WIDTH OF SEAM
SOLDER FED UNDER STRIP HERE

WHEN soldering seams on large surfaces such as tin roofs, large tanks, etc., you can save a lot of time by employing an electric flat iron as illustrated in the accompanying drawing. The heart of the stunt is a folded metal strip attached lengthwise to the bottom of the iron which glides down the seam applying the solder as fast as you can feed it. How to bend the strip is shown at the left. In use, the flat iron is plugged into a convenient lamp socket. When running the iron along a seam, the solder is fed in under the strip at either end of the iron. The heated copper strip melts the solder and at the same time spreads it evenly on the seam, doing a perfect job in a jiffy. Of course, the metal should be prepared for soldering in the usual manner.—A. H. Waychoff.

Guard Keeps Walkers Off Lawn Corner

IF YOU live on a corner and have an unfenced lawn you no doubt object strenuously to having people cut across your yard to save a few steps. Here's how to put a stop to this short-cutting. First lay hands on a piece of screening about the size specified in the accompanying drawing. Then drive three stakes, one in the corner, and two others along the sides, as illustrated. This done, stretch the wire between the stakes and nail it in place. Finally apply a coat of bright green paint, so that no one can miss seeing the guard. If you have no screening available you can use pipe or heavy wire.—D. Van Horn.



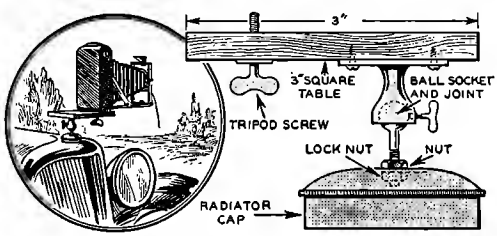


Protect Slopes Against Erosion

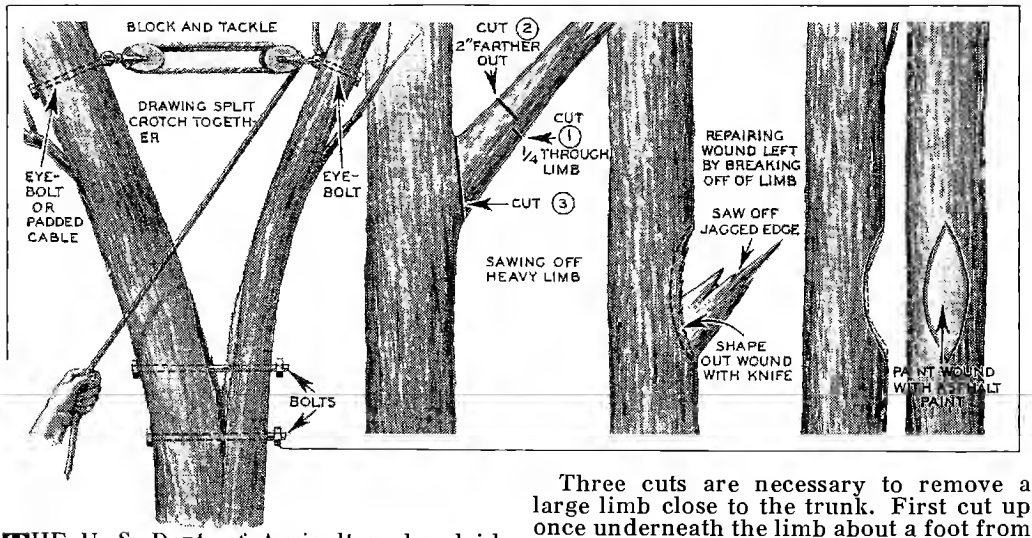
AN ingenious stunt employed by California highway engineers to prevent erosion of banks and hills can be adapted to use on your own lawn. With this method, illustrated in the drawing at the left, any slope over 30 degrees can be thoroughly protected against the heaviest rains. An inch or two of straw or light brush mixed with soil is laid over the slope and chicken wire is anchored over it. Next a thin layer of sifted soil is spread on the wire and sifted. Continuous downpours won't phase this type of a guard in the least and you'll be assured of finding your front yard just where you left it, after a storm.—Hi Sibley.

A Radiator Cap Camera Tripod

EMPLOYING this clever stunt, motorists who like to take scenic photos en route can leave their tripods at home. On an auxiliary radiator cap is mounted the shank of half of a ball and socket joint, available from any auto shop. The upper section of the joint attaches to a platform on which the camera is seated for taking pictures. When taking a picture simply change to this radiator cap.—L. B. Robbins.



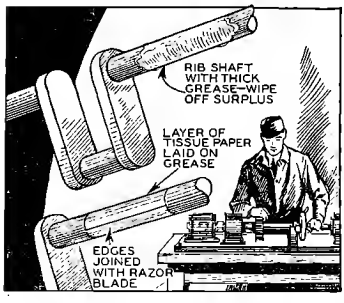
First Aid for Damaged Trees



THE U. S. Dept. of Agriculture has laid down a few rules for giving first aid to trees that may be followed by anyone. Lightning and wind usually tear off a limb or split a crotch. If a limb has been torn off near the trunk the jagged edges should be sawed off and the wood shaped with a sharp knife. Splintered wood may be chiseled away. The outline should be regular and pointed at the top and bottom to prevent dying back of the bark cut off by the sap flow. The wound should finally be smoothed and painted with asphalt or Bordeaux paint. Asphalt paint may be made by dissolving asphalt in pure oil of turpentine.

Three cuts are necessary to remove a large limb close to the trunk. First cut up once underneath the limb about a foot from the trunk, sawing in till the weight binds the saw. Then make a downward cut two inches farther out. When the limb falls it will not split the trunk or rip off the bark. The third cut is then made as close to the trunk as is convenient. The wound should be painted when finished.

In the case of a split crotch, draw the branches together with a block and tackle and hold the injured members in place by passing bolts through the tree. If the strain is too great to be held by the bolts, as illustrated. When job is finished, holes may be filled with cement and padded over. When working on a thin-barked tree, rubber soled shoes should be worn.

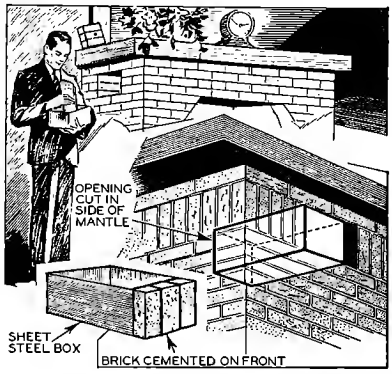


Handy Method for Pouring Babbitt Bearings

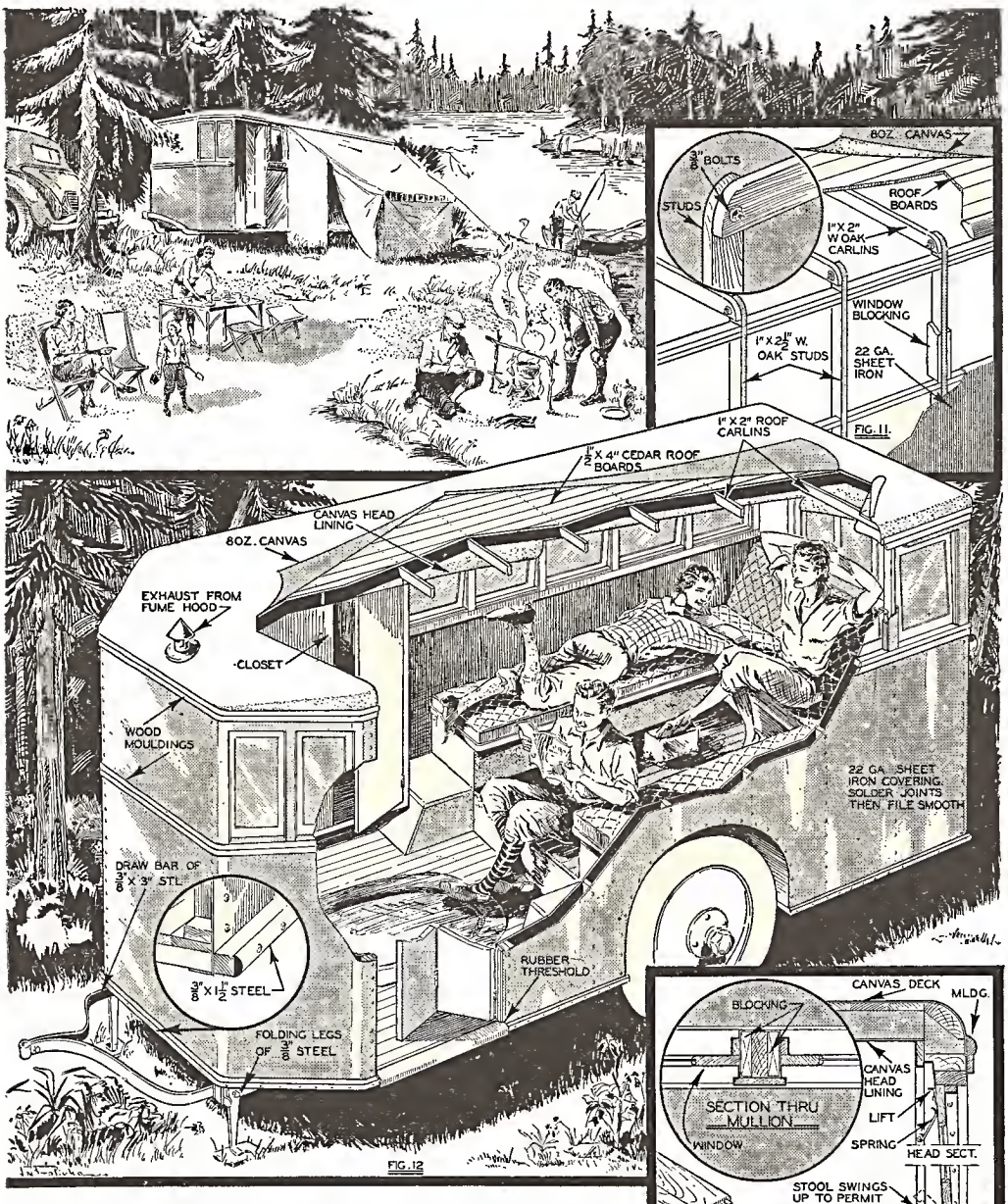
BABBITT bearings when poured in the usual way are very tight and hard to break loose. They must be turned in or burnished to a fit. To save all this trouble, cosmolene the shaft and wipe it free of excess oil. A piece of tissue paper is then patted down around the shaft on this layer of thin grease, and joined by close edges. This tissue paper will be charred and will fall out after babbitt has set, and a well-fitting bearing will result. —Abraham Manner.

Fireproof Vault Built in Mantelpiece

WHY worry about those insurance policies, deeds and valuable papers at home when you can deposit them in a vault built into your fireplace. Here's how it's done. Remove several bricks at a place where you know you will not enter a flue passage. Then on the inside put a couple of flat bars to receive a small concrete box which you can cast in your workshop. The bricks taken out are now to be cemented together, forming a door. All around the outside of the door cement asbestos sheets the thickness of the old mortar joints.—B. H. Thomas.



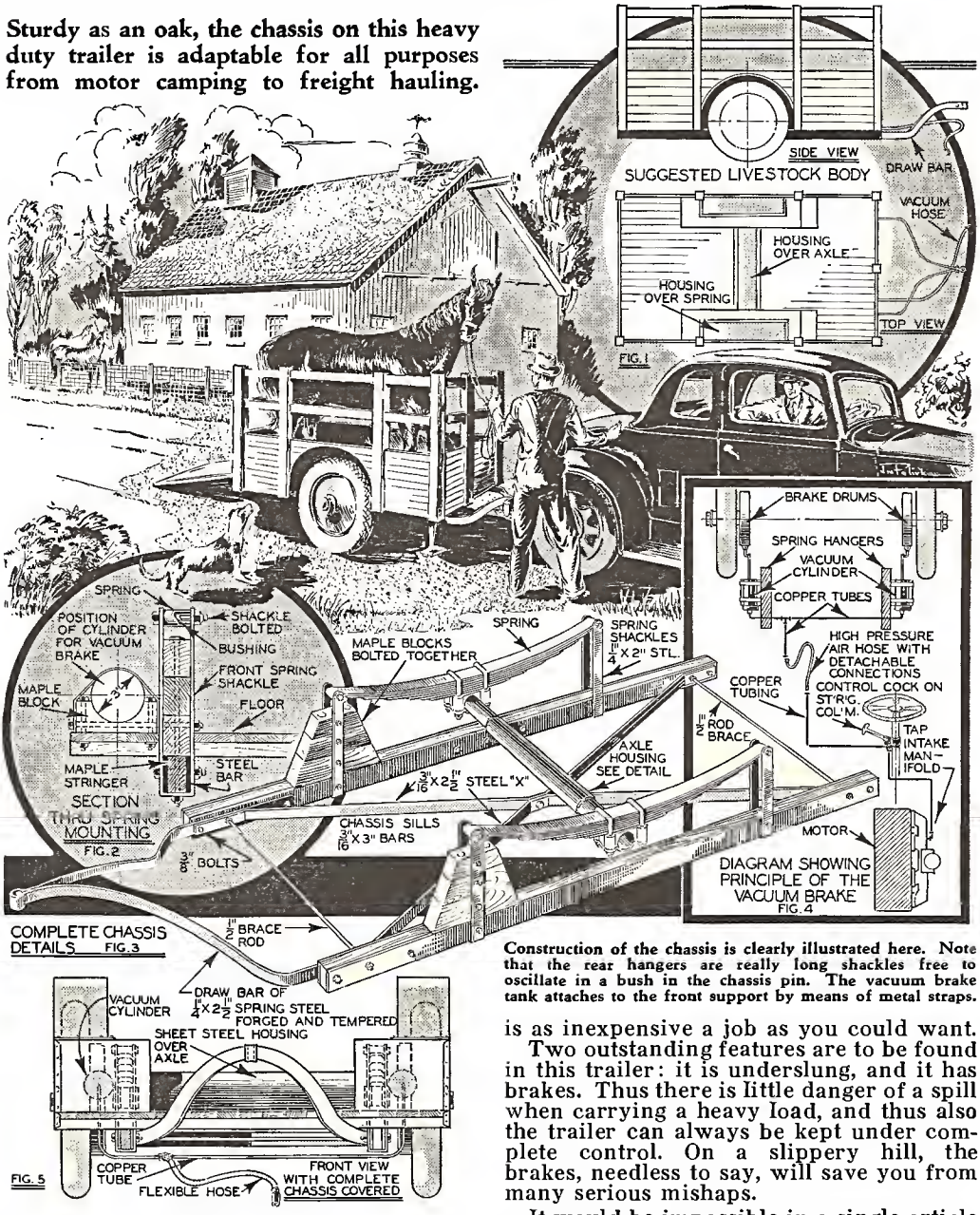
"Heavy Duty" Underslung



How a sturdy, serviceable house trailer can be built upon the "heavy duty" chassis is illustrated in these sketches. From details given the builder can adapt the design to his own peculiar conditions. With a lean-to tent attached to each side of the trailer the outfit will "sleep" and "eat" 8 persons comfortably. Note that the axle is back of the center line of the chassis. With this arrangement, the weight of the front of the trailer is partly offset by the weight of the passengers, water tank, and other heavy paraphernalia in the rear. In any case, a weight of 100 to 200 lbs. on the draw-bar is an advantage, as it prevents the rear of the towing car from bouncing. Farmers will find the chassis adaptable for construction of a trailer for hauling stock, farm produce, etc. On the other page is illustrated a design for a stock trailer. In this case it is advisable to lay down a floor of extra heavy planking. Note that the back lets down to form a gangway for the horse. Balance of the trailer subjects the horse to a minimum of jouncing. . . . The underslung trailer is recommended for use in districts where the roads are reasonably good. Of course, in heavy sticky "gumbo" the underslung trailer would be out of luck, because of its limited clearance, but so would any other type of trailer.

General Purpose TRAILER

Sturdy as an oak, the chassis on this heavy duty trailer is adaptable for all purposes from motor camping to freight hauling.



Construction of the chassis is clearly illustrated here. Note that the rear hangers are really long shackles free to oscillate in a bush in the chassis pin. The vacuum brake tank attaches to the front support by means of metal straps.

The draw bar curves out and above to hook on the auto at height illustrated in this front view drawing.

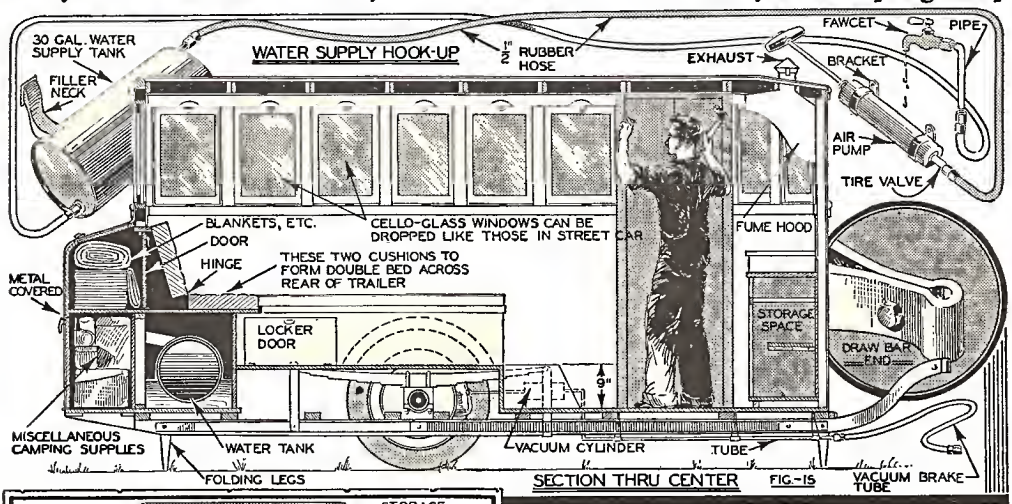
DAIRYMEN, truck gardeners, orchardists, motorcampers—anyone with any hauling to do—will find in this trailer chassis just the thing to fill a long-felt need for extra freight space. With auto wrecking yards teeming with axles, springs and wheels which can be bought for a song, it is as inexpensive a job as you could want.

Two outstanding features are to be found in this trailer: it is underslung, and it has brakes. Thus there is little danger of a spill when carrying a heavy load, and thus also the trailer can always be kept under complete control. On a slippery hill, the brakes, needless to say, will save you from many serious mishaps.

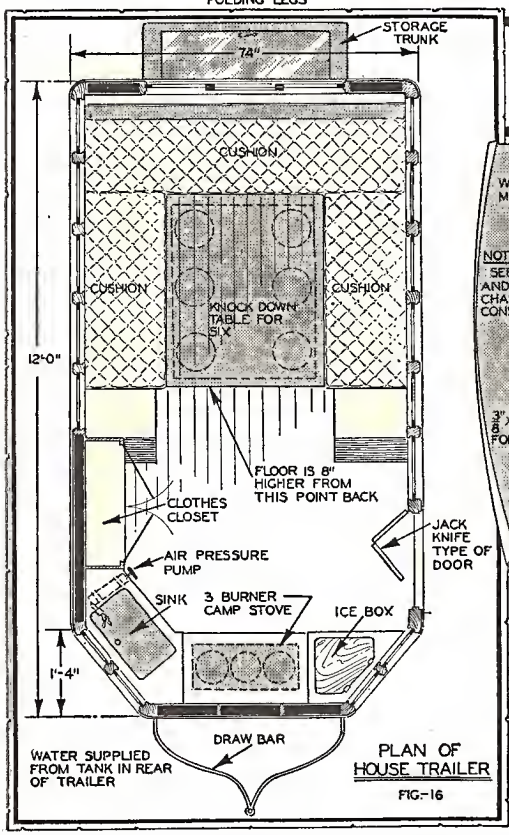
It would be impossible in a single article to give details of body design to meet all requirements, so this article centers on the essential chassis construction, leaving the style of body optional with the builder.

Instead of using a discarded front axle assembly as the basic unit, the underslung trailer is built up on a rear axle assembly of the full-floating type. Figure 6 illustrates this type of axle. The full-floating type axle

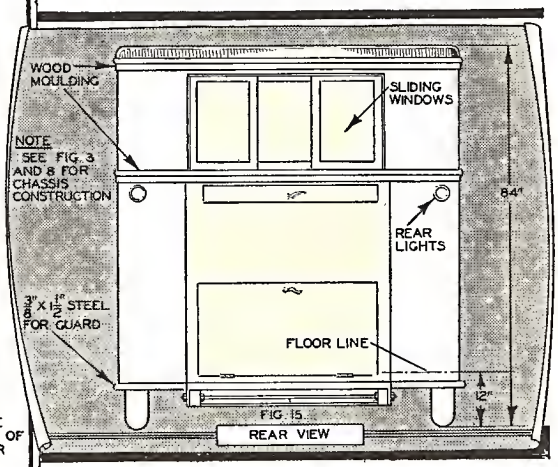
Comfortable "House" May be Built on This Chassis for Camping Trips



Ingenious layout of the house trailer permits convenient disposal of all luggage. Water is forced through faucet by means of an air pump installed as seen above.



Interior of house trailer can be arranged most conveniently by following these plans. Three passengers can be carried with plenty of room for cooking, eating, and so forth.



Rear elevation of the house trailer. Rear lights are required by law, so plan on built-in lights on the stern.

is one from which the driving axles can be withdrawn without disturbing the wheel bearings. They can be acquired at any auto wrecking yard for a dollar or two.

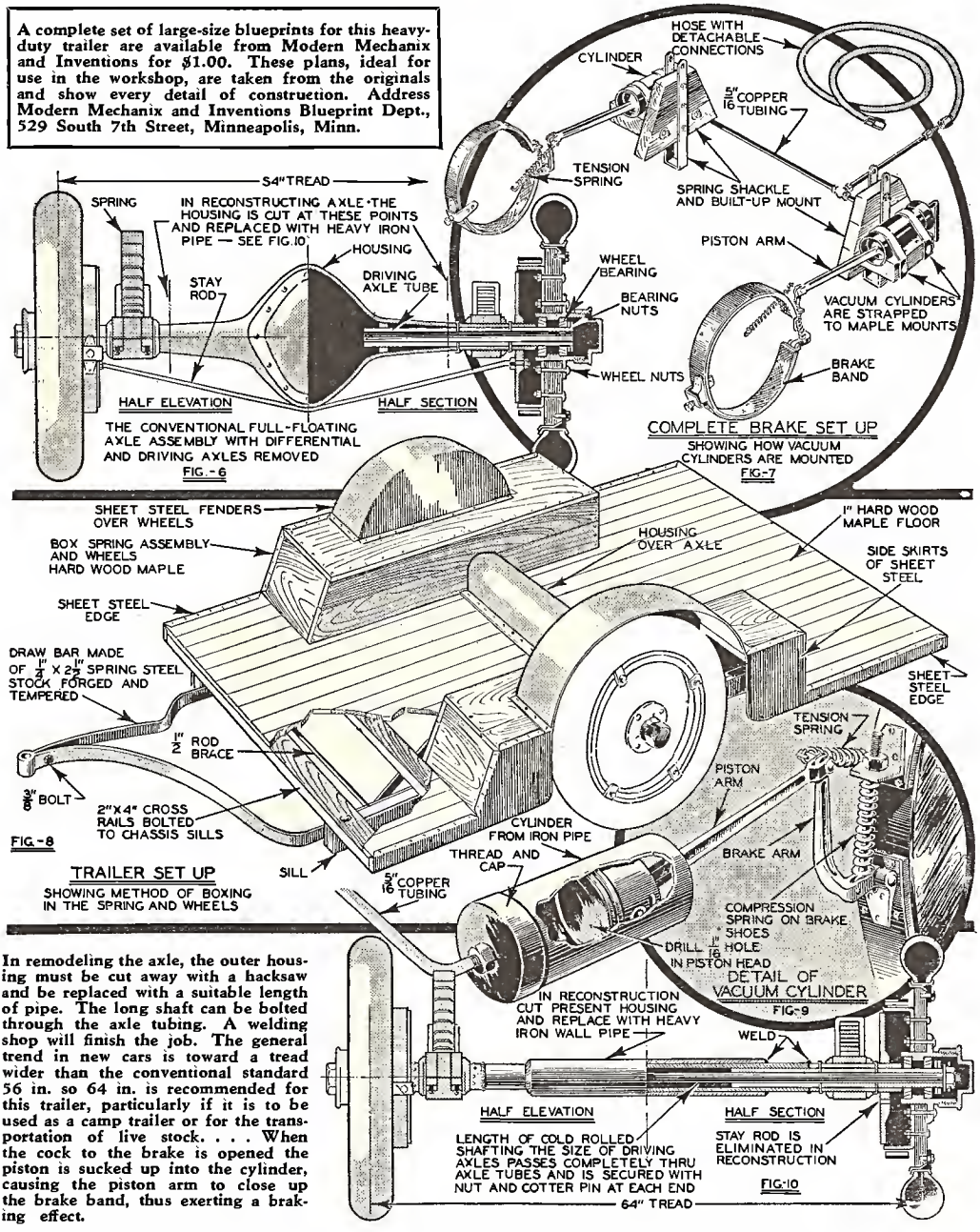
The only parts of the rear axle assembly for which there is a "used parts" demand are the driving axles and differential parts. The rear axle assembly from early Cadillac models is particularly recommended for the underslung trailer chassis.

Remodel the axle as illustrated in Fig. 10. The outer housing can be cut away with a hacksaw and be replaced with a suitable length of pipe. And the long shaft can be bolted through the axle tubing. Then the assembly can be towed to a welding shop for welding.

If brakes are to be used on the trailer—and they should—then the axle housing must be made rigid to the spring saddles. The saddle can be made rigid by clamping the cap tightly and using cap-screws, or by welding the entire saddle to housing. In welding, care must be taken not to draw the temper from the spring leaves. It is best to find the exact location of the spring saddle with reference to the brake band, and then remove the spring before welding.

Chassis Rides on Remodeled Rear Axle Assembly Taken From Cadillac

A complete set of large-size blueprints for this heavy-duty trailer are available from Modern Mechanix and Inventions for $1.00. These plans, ideal for use in the workshop, are taken from the originals and show every detail of construction. Address Modern Mechanix and Inventions Blueprint Dept., 529 South 7th Street, Minneapolis, Minn.


54" TREAD
SPRING
IN RECONSTRUCTING AXLE THE HOUSING IS CUT AT THESE POINTS AND REPLACED WITH HEAVY IRON PIPE — SEE FIG. 10
HOUSING
STAY ROD
DRIVING AXLE TUBE
HALF ELEVATION
HALF SECTION
THE CONVENTIONAL FULL-FLOATING AXLE ASSEMBLY WITH DIFFERENTIAL AND DRIVING AXLES REMOVED
FIG.-6
HOSE WITH DETACHABLE CONNECTIONS
CYLINDER
5/16" COPPER TUBING
TENSION SPRING
SPRING SHACKLE AND BUILT-UP MOUNT
PISTON ARM
WHEEL BEARING
BEARING NUTS
VACUUM CYLINDERS ARE STRAPPED TO MAPLE MOUNTS
WHEEL NUTS
BRAKE BAND
COMPLETE BRAKE SET UP
SHOWING HOW VACUUM CYLINDERS ARE MOUNTED
FIG.-7
SHEET STEEL FENDERS OVER WHEELS
BOX SPRING ASSEMBLY AND WHEELS HARD WOOD MAPLE
SHEET STEEL EDGE
DRAW BAR MADE OF 1" X 2 1/2" SPRING STEEL STOCK FORGED AND TEMPERED
1/2" ROD BRACE
3/8" BOLT
2"X4" CROSS RAILS BOLTED TO CHASSIS SILLS
FIG.-8
TRAILER SET UP
SHOWING METHOD OF BOXING IN THE SPRING AND WHEELS
SILL
5/16" COPPER TUBING
HOUSING OVER AXLE
1" HARD WOOD MAPLE FLOOR
SIDE SKIRTS OF SHEET STEEL
SHEET STEEL EDGE
TENSION SPRING
PISTON ARM
BRAKE ARM
CYLINDER FROM IRON PIPE
THREAD AND CAP
COMPRESSION SPRING ON BRAKE SHOES
DRILL 1/16" HOLE IN PISTON HEAD
DETAIL OF VACUUM CYLINDER
FIG.-9
IN RECONSTRUCTION CUT PRESENT HOUSING AND REPLACE WITH HEAVY IRON WALL PIPE
WELD
HALF ELEVATION
HALF SECTION
LENGTH OF COLD ROLLED SHAFTING THE SIZE OF DRIVING AXLES PASSES COMPLETELY THRU AXLE TUBES AND IS SECURED WITH NUT AND COTTER PIN AT EACH END
STAY ROD IS ELIMINATED IN RECONSTRUCTION
FIG.-10
64" TREAD

In remodeling the axle, the outer housing must be cut away with a hacksaw and be replaced with a suitable length of pipe. The long shaft can be bolted through the axle tubing. A welding shop will finish the job. The general trend in new cars is toward a tread wider than the conventional standard 56 in. so 64 in. is recommended for this trailer, particularly if it is to be used as a camp trailer or for the transportation of live stock. . . . When the cock to the brake is opened the piston is sucked up into the cylinder, causing the piston arm to close up the brake band, thus exerting a braking effect.

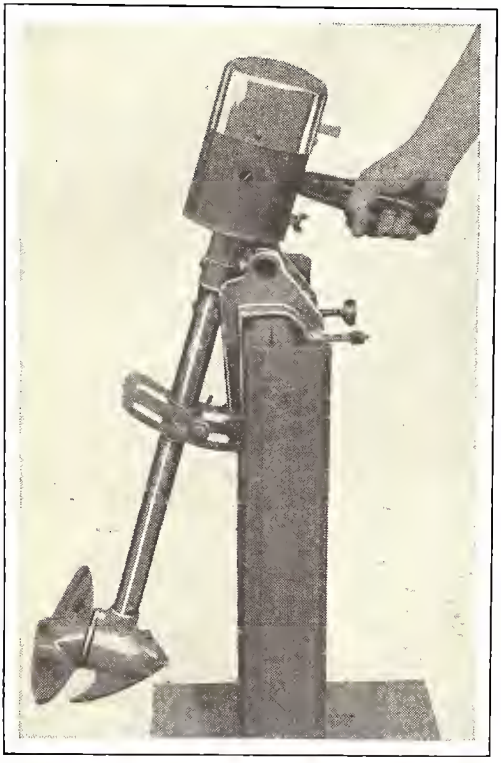
The emergency brake shoes serve no purpose on the trailer, so they can be removed from the brake drums.

After the axle has been prepared it is a comparatively simple matter to build the chassis. Figs. 2, 3, 5, and 8 show respectively the plan, side and front elevation, and the notations indicate the material used. Except for variations in length, the construction shown will serve for almost any body design.

The most important part of the chassis is the chassis sills. (See Fig. 3.) These are built up with a maple (or oak) center core 3" wide and faced on each side with 3/16"x3" steel bar. The overall width of the finished sill is the same as the springs of the trailer—probably 2¼" or 2½". The sketch shows the hanger built up with 3" blocks of maple, but one 9" block would serve as well.

(Continued on page 126)

Starter Motor Makes Outboard Engine—Ideal for Fishing



Gas motor of Johnson outboard is removed and in its place is installed starter motor operating off storage batteries. As the motor runs noiselessly, it's ideal for trolling.

IDEAL for trolling is the ingenious electric outboard motor devised by a Portland, Oregon, workshop fan. As may be seen in the accompanying photo, the lower part of the contrivance was taken from a Johnson outboard motor, and in the upper part—the place where the gas engine ought to be—was installed an old auto starter motor.

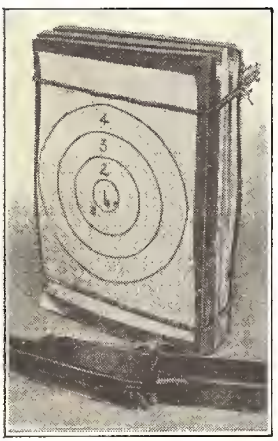
Two six-volt storage batteries furnish power. They are good for about eighteen hours of cruising on one charge. The engine turns over without the slightest noise, and is thus ideal for fishing. Weight, incidentally, is only 21 pounds.

Substitute for Stencil Brushes

PAINT shops in small towns rarely carry stencil equipment, especially the small brushes that are used for this purpose. But don't be downhearted. Your local drug store or hardware store carries a cheap brush that will serve excellently on a stencil job. This brush is the kind used in blacking shoes. Cut off the bristles about three-quarters of an inch from the end, making all the hairs level. Thus shorn, the brush will work nicely on a stencil.

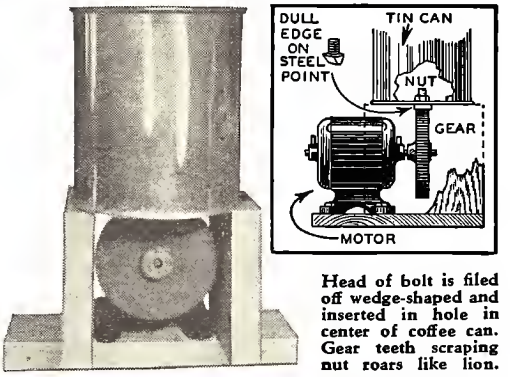
Magazines Make Target Backstop

BASEMENT targets using wood to stop the bullets are often found quite unsatisfactory because the area around the bull's eye soon splinters and permits the bullets to fly through the other side, damaging anything that happens to be in their path. There's a remedy for this dangerous situation, however. One experimenter found that old magazines, tied together as illustrated in the accompanying photo, make an unyielding back-stop. About four magazines of normal thickness are needed and they are held together with wire. The magazines should be of the small size, like the ATLANTIC MONTHLY, MODERN MECHANIX AND INVENTIONS, or SCRIBNERS.



Magazines are bound tightly with wire to make target backstop.

Simple Klaxon Roars Like Lion



Head of bolt is filed off wedge-shaped and inserted in hole in center of coffee can. Gear teeth scraping nut roars like lion.

SIMPLE, yet powerful as the roar of an infuriated lion, this easily-built Klaxon will startle you with its suddenly-developed volume. Here's how to build it. First a fine toothed gear is set-screwed on the shaft of a fractional horse-power motor. Then a small piece of hard steel ground to a dull edge is fastened to the center of the bottom of a large tin can, as illustrated above. The device is finished by building a simple framework about the motor and of suitable height. The revolving gear teeth scraping against the steel point on the can will cause the bottom of the can to vibrate violently.

A close estimate of the weight of ice can be reached by multiplying the length by the breadth by the thickness of the block, and dividing the product by 30. This method will easily detect short weight.

Photo Magic and Profit from Speed Film

"Human interest" photos like the two shown above may be snapped without special illumination when using the new supersensitive panchromatic film. "Candid camera" photos of celebrities command good price from newspapers and other interested parties.

FEATS of photography long considered impossible have now been placed within the reach of everybody by the introduction of high-speed film coming in rolls and packs. When used in conjunction with the high-speed lenses that are now available on low-priced cameras, particularly the miniature type, the new film, known as supersensitive panchromatic or other similar names, will surprise even the seasoned professional.

For instance, you can shoot pictures of your friends at a banquet table or party, if the room is at all well-lighted. You can snap "candid" pictures of celebrities on trains. You can procure good pictures of store windows which are of particular interest to you.

You may even make some extra money photographing store windows and selling the pictures to trade journals, providing, of course, that there is something sufficiently unusual about the window. Candid camera shots of well-known persons in restaurants or other informal settings sometimes can be sold to the newspapers, restaurant owner or even the subjects themselves.

If you have a camera with a lens whose speed is rated at f:3.5, and a shutter having a 1/10 second setting, you can photograph almost anything as well lighted as a store window, theatre stage, railway coach or dining room, providing you use the new panchromatic film.

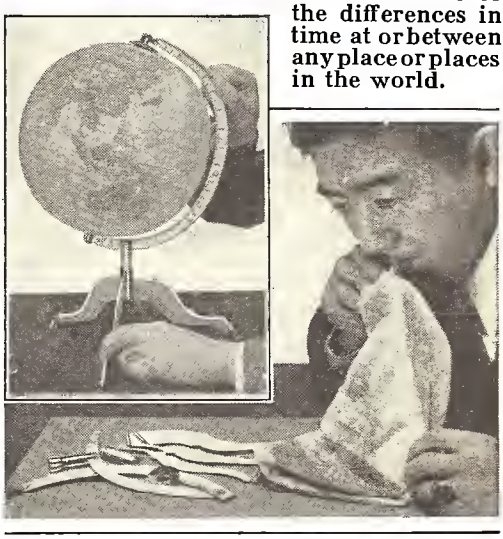
Even if your camera lens is no faster than f:4.5, or even f:6.3, you can obtain unusual pictures simply by giving a little longer exposure.

By using a color filter you can procure good cloud effects—when there are clouds. It is best for photographing distant objects.

Globe Blows Up Like Balloon

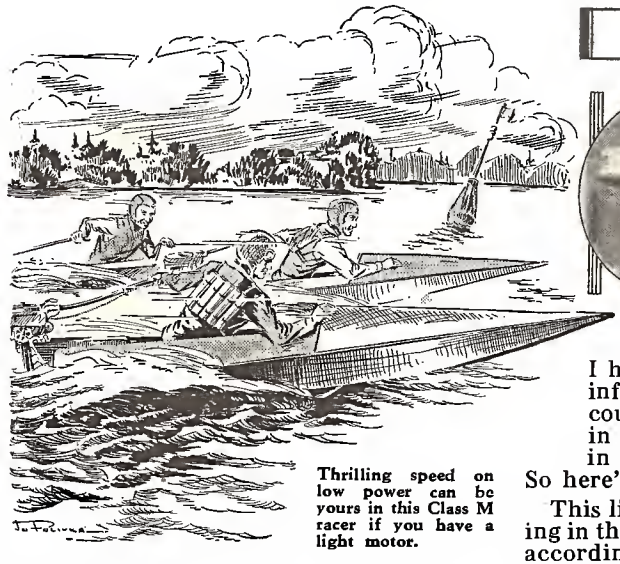
A GLOBE that stands almost two feet high when set up can be completely taken down in a few seconds and made into a package that will fit the pocket. The globe itself is a perfectly round balloon made of a special rubberized Japanese silk which will not leak air.

No rubber is visible on the globe. Its surface is fine silk on which the continents and oceans are accurately printed in delicate colors. A small metal "Hour Circle" placed at the North Pole makes it possible to figure the exact time or the differences in time at or between any place or places in the world.



Made of special rubberized Japanese silk, this globe can be quickly inflated and set up. All terrestrial features are marked distinctly. Can be carried in pocket when deflated.

PLANS for a MIDGET



Thrilling speed on low power can be yours in this Class M racer if you have a light motor.

Nifty and neat, and up-to-date is this little baby hydroplane of Fitzgerald's.

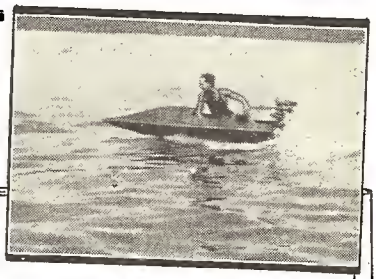
SIDE VIEW OF THE COMPLETE BOAT

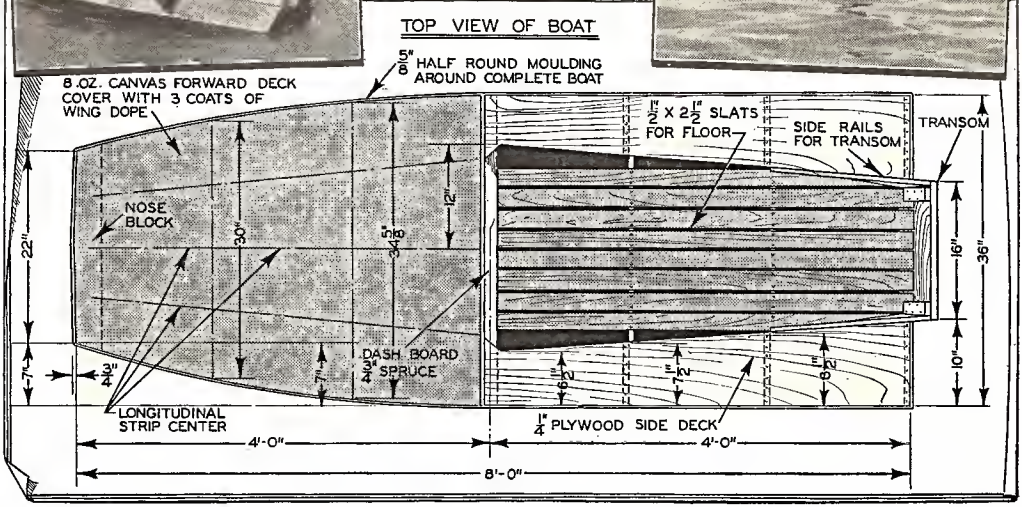
MY SALUTE to the web footed members of the Hangar Gang! This is Eddie Fitzgerald talking, and may I introduce myself again as the chap who made Andy's column some little time ago with a picture of my Midget? Remember the letter where I said I'd answer all inquiries concerning the little go-devil?

That was some time ago, and I wish now I hadn't volunteered to cough up the info, because I have since moved a couple of times from my former home in New York City, and letters persist in dogging me to my new address. So here's the dope for all:

This little cart was built for next to nothing in the way of materials, and constructed according to instructions I'm shooting you in a few minutes. She will do nicely as a racer in the new class "M" or Midget class, and will skedaddle along at about 25 miles an hour with one of the small 2-cylinder opposed 2 h.p. Johnsons, or equivalent. Outboard Motors Corporation of Milwaukee, Wisconsin, or the Johnson Motor Company, of Waukegan, Illinois, or the Caille Motor Co., of Detroit, Michigan, all make

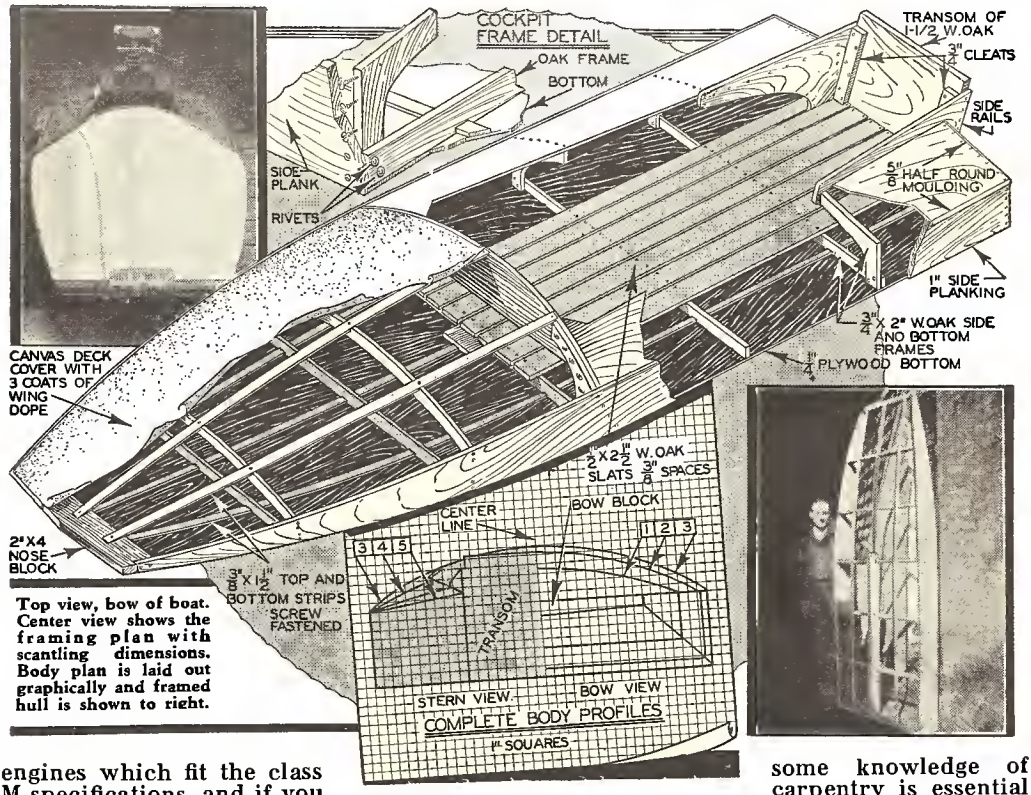
Below is the plan construction view of the Midget. The deck ribs and plywood side decking, and floor slatting are clearly shown. Left, Eddie Fitzgerald pauses for a look-see at a camera, and at right he is shown on the Hudson.





Outboard HYDRO

designed by **Edw. Fitzgerald**



Top view, bow of boat. Center view shows the framing plan with scantling dimensions. Body plan is laid out graphically and framed hull is shown to right.

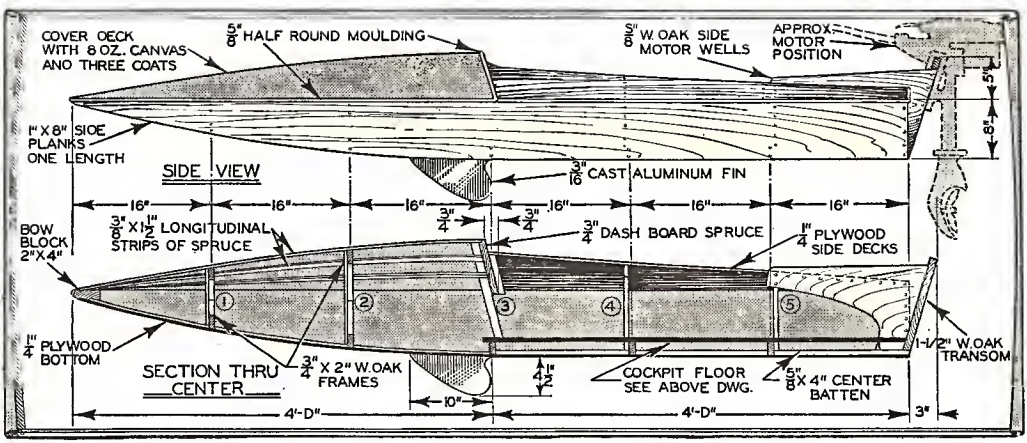
engines which fit the class M specifications, and if you will write these firms you can compare the merits and prices of the motors if you do not have one already.

I got up a mimeographed sheet that I sent to a whole slough of fellows who asked me about my little job, and here is the sheet, word for word:

Good tools, plenty of space and at least some knowledge of carpentry is essential to build this little hydro. Tools should include: Hand or breast drill, small plane, ratchet screw driver (unless you like blisters) and, of course, hammer and saw, a good rule; a square will also be very handy.

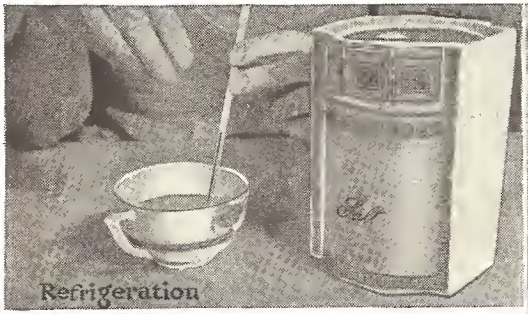
2 pieces of white pine, 8 ft. x 8 in. For

(Continued on page 128)

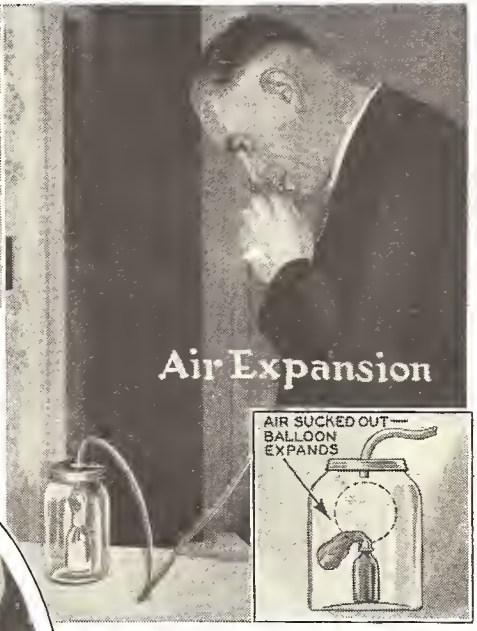


The outboard and inboard construction profiles of Eddie's Midget. You will note there is no step. In such a short boat, unless used for extreme racing, there is little to be gained by the use of a step. Framed thus, boat is easier to build.

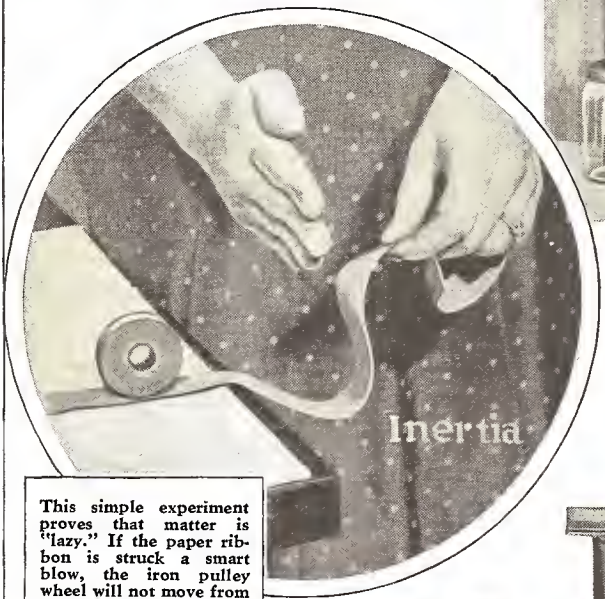
Learn Physics from Mystifying TRICKS



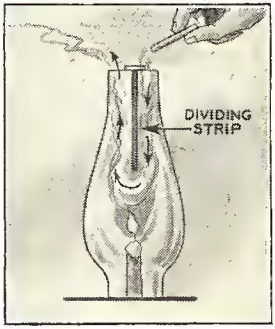
Principles of refrigeration are demonstrated by allowing cracked ice to melt in cup, then sprinkling little salt in water. Temperature soon drops to point below that of the ice, though water remains liquid. Explains salt in cream freezer.



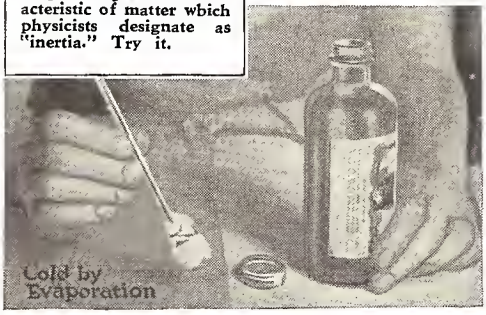
How air expands when pressure is removed is shown by expansion of rubber balloon (with mouth tied over bottle) when the air of the big jar is sucked out through hose.



This simple experiment proves that matter is "lazy." If the paper ribbon is struck a smart blow, the iron pulley wheel will not move from its position, due to characteristic of matter which physicists designate as "inertia." Try it.

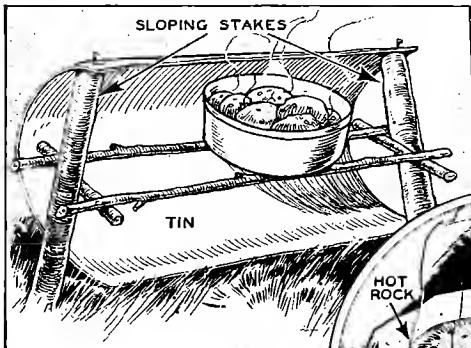


Circulation of air due to contact with heat and cold is demonstrated here. Smoke follows downward current of relatively cold air, while heated air on other side of strip rises, drawing in cold air.



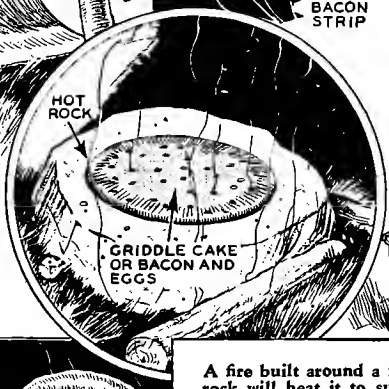
Cold is mere absence of heat. When rubbing alcohol evaporates from cotton on thermometer, heat is absorbed from surroundings and "cold" is produced, as indicated by falling mercury. This explains the principle of electric ice boxes.

COOKING *Kinks for the* CAMP

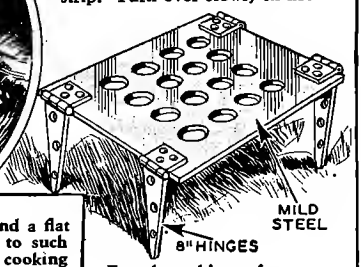


An excellent camp warming oven is shown above. A sheet of tin or galvanized iron is bent in a curve to reflect the heat of the camp fire; thus anything set midway between top and bottom of the sheet will be in a "hot spot." Stakes can be used to support the metal in the manner shown.

One of the tastiest tidbits in camp is the toasting of a half bun with a strip of bacon around it, in manner shown. Bread also can be used if cut to right dimensions. Run stick through one end of the bacon, then through the bread, then through the other end of bacon strip. Turn over slowly in fire.

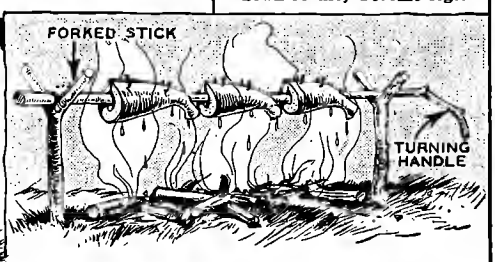


A fire built around a flat rock will heat it to such an extent that cooking can be done on it. When flames have died down, wipe off the rock, grease it, and use it as a griddle. This is ideal for cornmeal flapjacks, eggs, fish, bacon, and even biscuits.



Four large hinges form corner supports of this excellent folding camp griddle. They are riveted to each corner of a piece of ⅛-inch sheet iron, 10 by 14 inches. To use, drop the free ends down so they become legs.

Scorched knuckles acquired while toasting marshmallows or hot dogs on the end of a pointed stick are eliminated by the simple protective measure of placing a sheet of paper or the top of a cardboard box on the stick as a protective shield. Of course, the paper must not be too close to the flames.

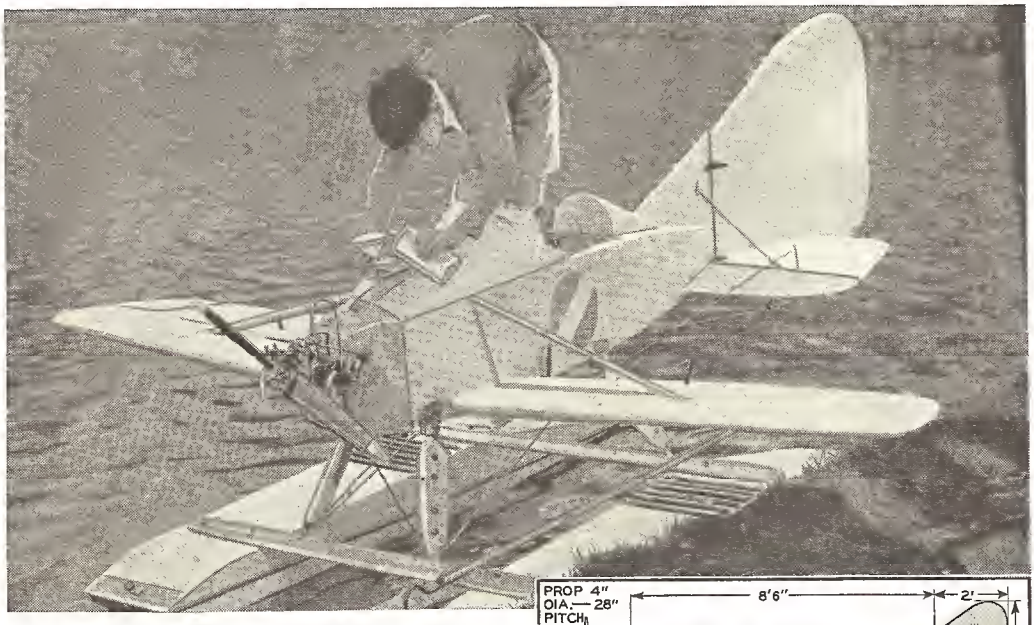


Handy method of preparing fish with no equipment. Clean the fish and wrap them around a willow sapling or any non-resinous wood, holding them in place with pins through the flesh. Seasoning is placed inside, together with flour mixed with lard. The stick is turned by means of a crooked projection, as shown. As the fish is revolved grease and spices are sprinkled over the outside.

For the semi-permanent camp an excellent type of fireplace is shown at the left. Choose a hilly piece of ground which can be hollowed out slightly as indicated in the drawing. Build the fire at edge of this little cave and the heat will soon dry out the earth at back of cave, which becomes a reflector for heat. If embers are raked away, one can roll up in a blanket in the fireplace itself, which will retain enough heat to keep one comfortable.

Item number one on the list of important fundamentals of comfortable camping is the preparation of food. The several kinks above are practical stunts worked out by men who have tried them thoroughly. Keep them in mind for use when you go off fishing or deer hunting this summer or fall. Simple materials found in the woods are used.

Penguin Seaplane Skims Water 15 m.p.h.



Tony Porter, young English flying fan, filling up for a cruise around the lake. Constructed like plans at right, craft skims water at 15 m.p.h. under power of ½-h. motor.

MR. TONY PORTER, who lives at Wentworth, England, is fortunate in having a dad who goes in for the same kind of thing Master Tony does. Consequently Master Tony was recently presented with a midget seaplane having a twin opposed motorcycle engine to wind its prop around, real floats, real fuselage and everything.

Would you like to build a simplified version? MODERN MECHANIX AND INVENTIONS designers have sketched out the proportions of this little water scooter, and present herewith plans for a non-flying plane which can accommodate any youngster weighing less than 100 lbs.

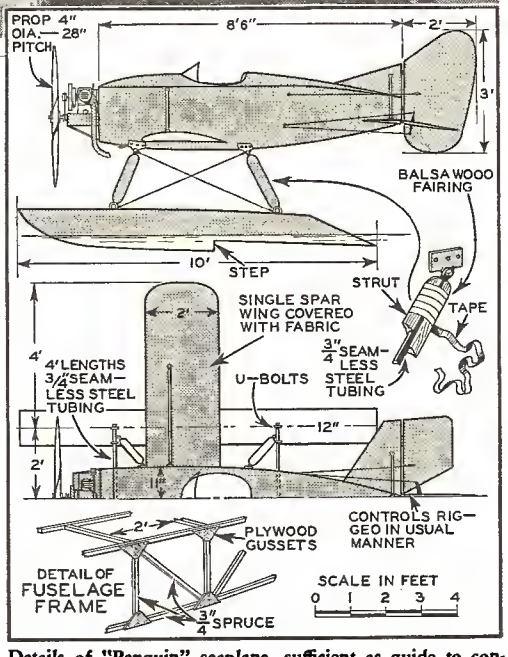
The floats are 10 ft. long and a foot and two inches square. The outboard profile is like that of the drawing.

The ¾" spruce longerons, braces and cross pieces of the framework are glued with casein glue and fastened with brass screws. Then eighth-inch Haskelite is nailed on with escutcheon pins along the edge. The edges and the seams must be treated with marine glue.

The floats are joined by two four-foot lengths of ¾" seamless steel tubing held in place by U-bolts as shown in the sketch.

The control elements may be constructed in any conventional manner, possibly the best being out of ¼"x⅜" spruce flat strips riveted with small copper rivets.

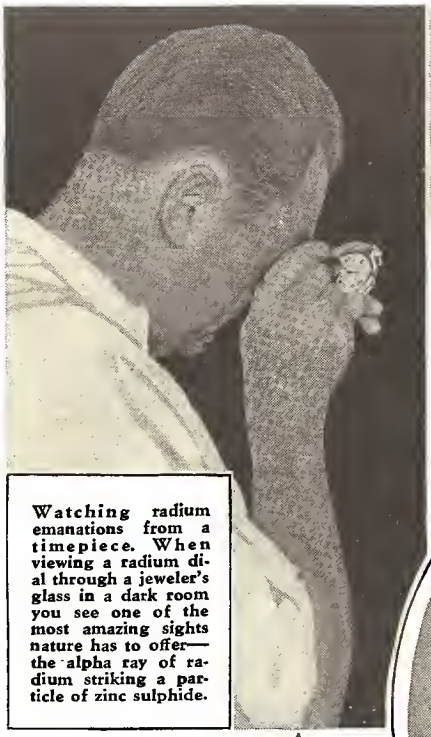
The covering is done in the orthodox manner, using AA muslin, obtainable at any department store. Acetate dope is brushed on thickly. It will dry after three or four hours, and another coat can be brushed on. After the third or fourth coat paint can be applied and the component parts, fuselage, wings and surfaces, mounted on the floats.



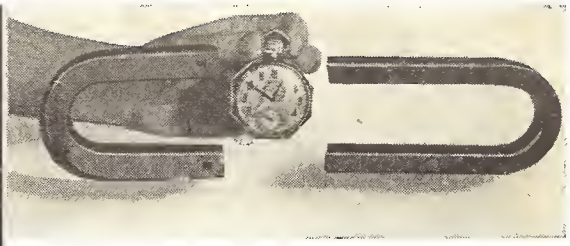
Details of "Penguin" seaplane, sufficient as guide to construction, are given here. Only a little gas should be carried.

Any motor of about a half to one horse power, such as an old washing machine motor or a power head from an outboard engine, can be used to drive the propeller.

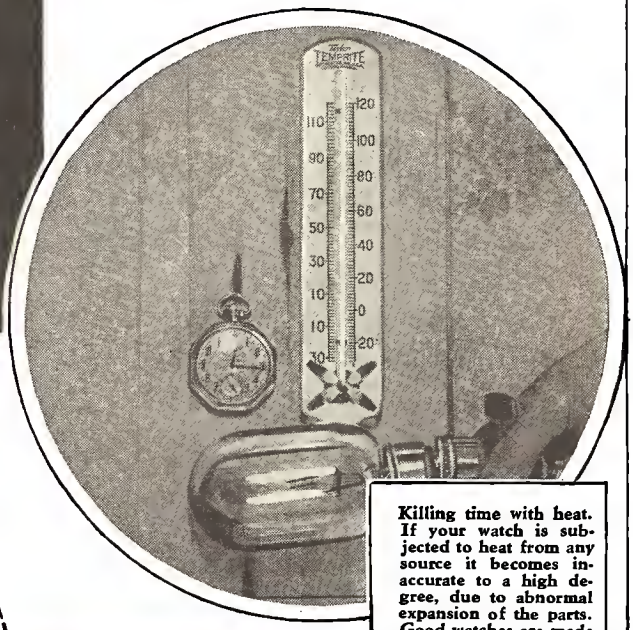
Novel Scientific TRICKS With Watches



Watching radium emanations from a timepiece. When viewing a radium dial through a jeweler's glass in a dark room you see one of the most amazing sights nature has to offer—the alpha ray of radium striking a particle of zinc sulphide.



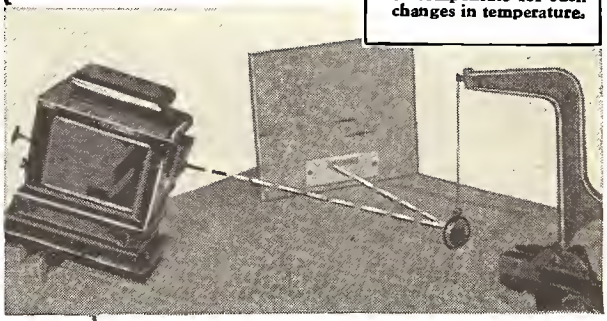
Magnetism makes time fly. Motion of the watch escapement is speeded up considerably when the timepiece is held in the magnetic field between two horseshoe magnets as illustrated here. It is advisable to use only a cheap watch for this stunt. It can be demagnetized by placing in center of A. C. solenoid.

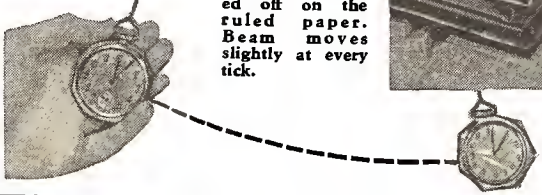


Killing time with heat. If your watch is subjected to heat from any source it becomes inaccurate to a high degree, due to abnormal expansion of the parts. Good watches are made to compensate for such changes in temperature.

Watches become seasick. If a watch is allowed to swing for a long time with a pendulum motion its time keeping faculties will be almost completely destroyed. Delicate mechanical forces interplay inside the watch, interfering with movements of members.

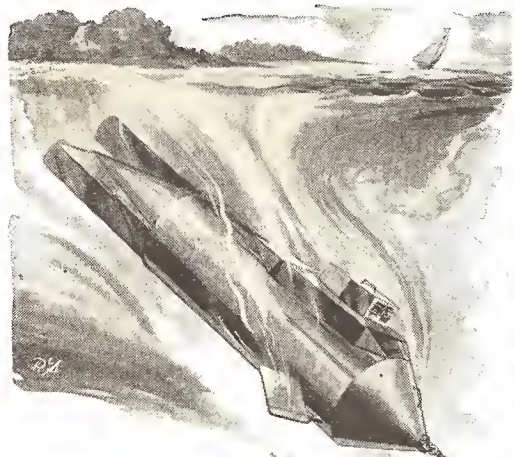
Mechanical action and reaction rules that your watch has a tendency to move slightly every time it ticks, as may be observed in the experiment at the right. The tiny beam of light strikes the watch face and is reflected off on the ruled paper. Beam moves slightly at every tick.

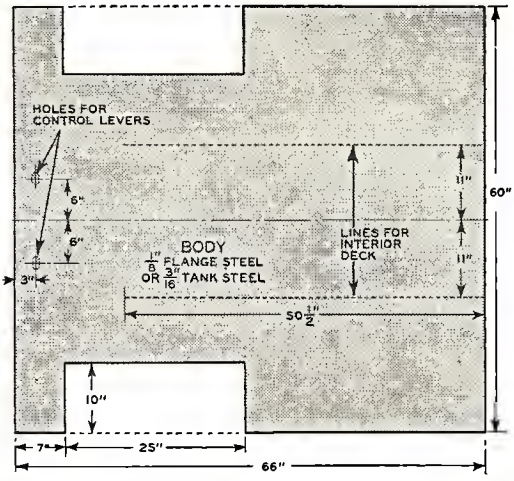


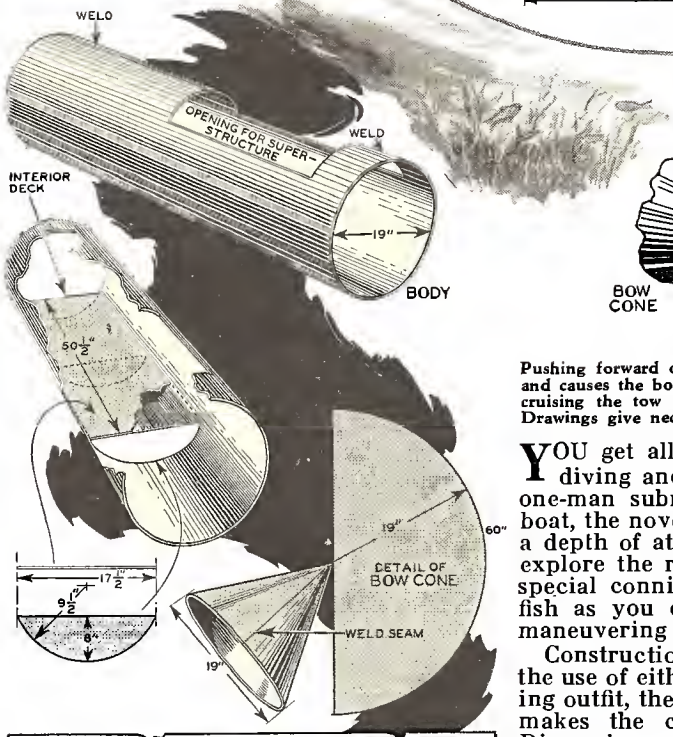


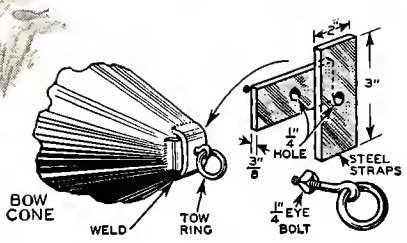
When performing these scientific tricks use only cheap watches. Expensive timepieces are liable to serious damage from physical forces at work.

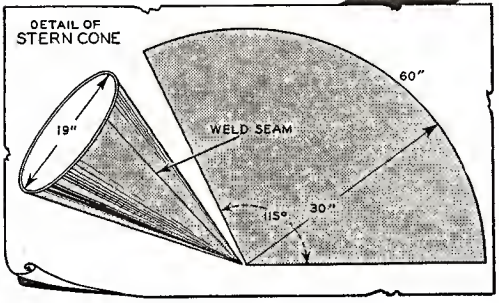
Take Thrilling Underwater











Pushing forward on control levers flips up the diving fins and causes the boat to submerge. For smoothest undersea cruising the tow rope should be at least 100 feet long. Drawings give necessary constructional and assembly data.

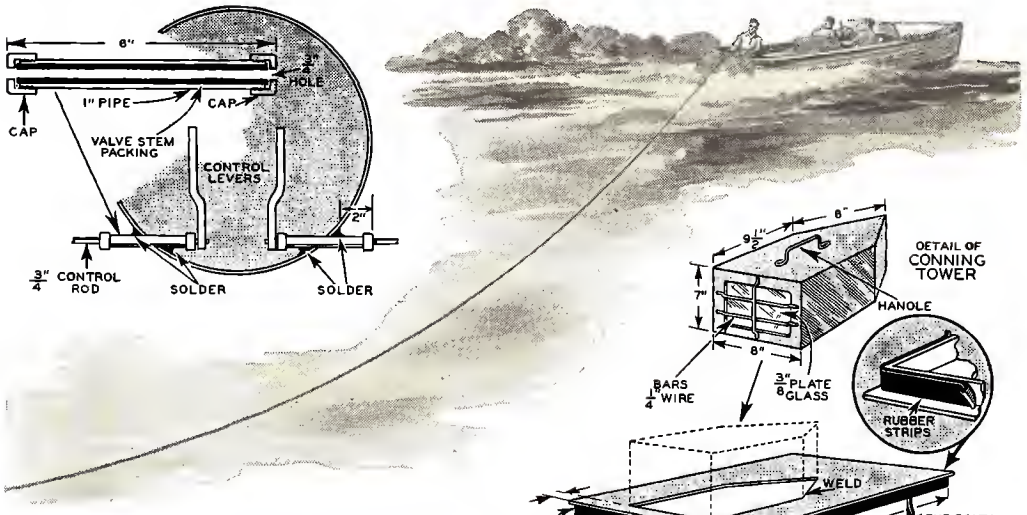
YOU get all the keen thrills of deep-sea diving and underwater cruising in this one-man submarine. Towed by a motorboat, the novel craft will take you down to a depth of at least 30 feet, where you can explore the river or lake bed. Through a special conning tower you can watch the fish as you dart among them, the while maneuvering about like a real submarine.

Construction of the sub-sea boat calls for the use of either a welding torch or a riveting outfit, the former being preferred, as it makes the craft completely water-tight. Dimensions herewith are for welding. Measurements will have to be increased for overlapping if the members are riveted.

One-eighth inch flange steel or three-sixteenths inch tank steel is used throughout. Complete dimensions for the body are given in the drawing at the top of the page. The sheet should be bent into a cylinder 19 in. in diameter and welded.

For the accommodation of the skipper, and also for internal bracing, an interior deck is constructed. On this the navigator lies, stomach down, and hands on the con-

Cruise in ONE-MAN SUB



Control rods pass into hull through the 1-in. pipes, which are soldered to the metal as seen above. Skipper inspects underwater scene through plate glass in the conning tower. Eye bolts are secured over hooks to tighten down tower.

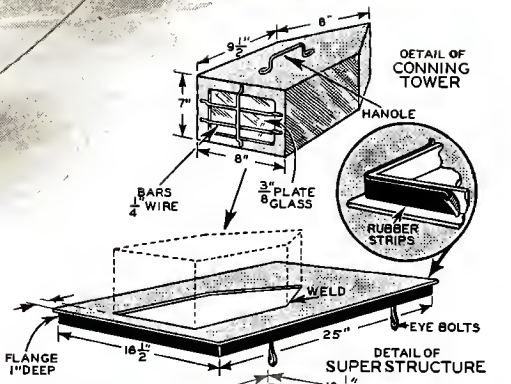
trol lever, as demonstrated in an accompanying drawing. The deck end pieces are welded in place, as is the deck itself.

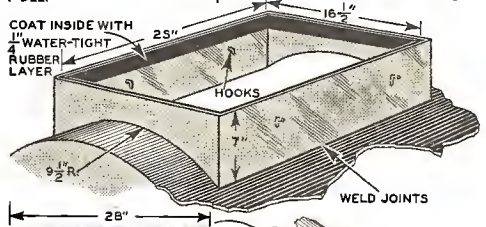
All other necessary dimensions are given in the accompanying drawing. The construction of the conning tower lid, however, calls for comment. Note that the "lid" is equipped with a strip of rubber which renders the sub air-tight when the conning tower is tightened down. Take particular pains here to get a good, water-tight fit.

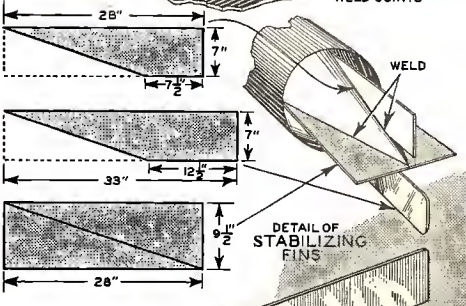
A point that has to be determined separately for each individual case is that of buoyancy. This depends partly on the weight of the materials, and partly on that of the operator. The floating buoyancy may be lowered by boring numerous holes in the bottom of the hull below the interior deck, the effect of these being to give the craft a water ballast.

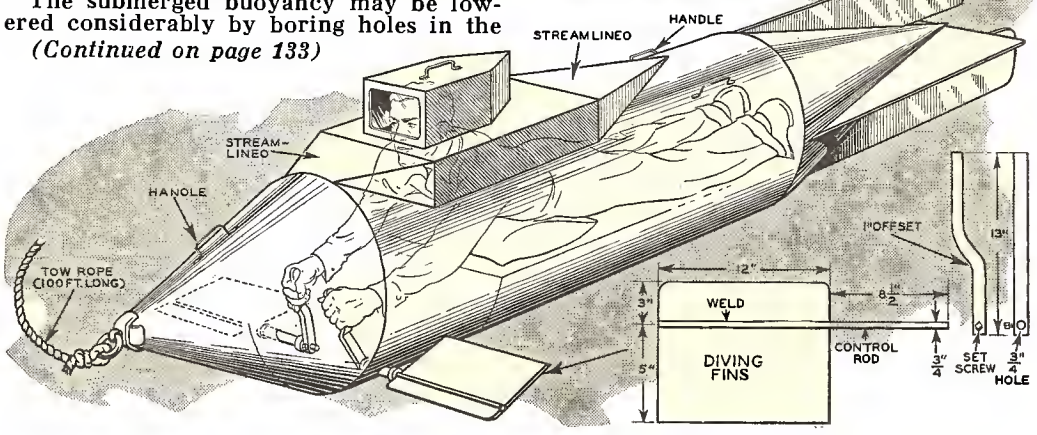
The submerged buoyancy may be lowered considerably by boring holes in the

(Continued on page 133)





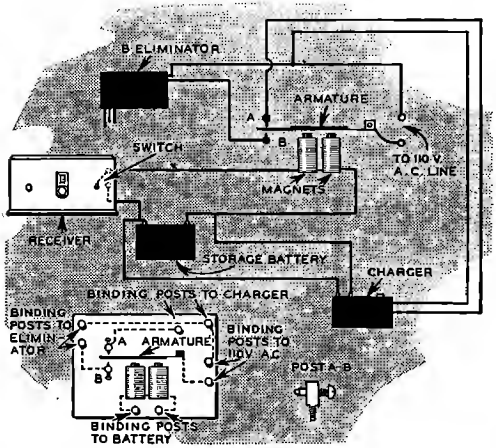




SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

Automatic Relay Keeps the Radio Battery Fully Charged



Mount binding posts, armature and magnets on baseboard and hook up as illustrated. When receiver is shut off, charger is cut into circuit to keep battery up to full charge.

AMATEURS and broadcast listeners using battery operated receivers will find this trickle charger relay a great convenience. When you're through operating it automatically cuts in your trickle charger and thus always keeps your battery up to full charge.

First procure a pair of heavy duty magnets from an old door bell and mount them on a baseboard as illustrated in the accompanying drawing. Remove the bell armature and mounting and reinstall them over the magnets so the armature clears them about ¼ in. Wire the spring pivot to a binding post as illustrated.

Now make your two contact posts A and B as illustrated. The contact screws should have flat pointed ends. Screw A makes permanent contact with the armature, while screw B makes contact only when the armature is pulled down.

Wire up the relay according to the circuit. Operation is as follows: Switch on the receiver and the magnets are energized, pulling the armature down to B. This disconnects the trickle charger and completes the AC circuit to the eliminator. When the receiver is switched off the eliminator is disconnected and the charger cut into the circuit, thus putting battery on charge. If B batteries are used you won't need the eliminator circuit.

It will be advisable to insert a fuse in the line to the 110-volt A. C. house current.

Simple Volume Control Permits You to Adjust Receiver From Easy Chair

MANY modern broadcast receivers permit listeners to tune in at the chair while the speaker is over in a convenient corner, so it will not be a bad stunt for us to consider making a remote volume control for the old set.

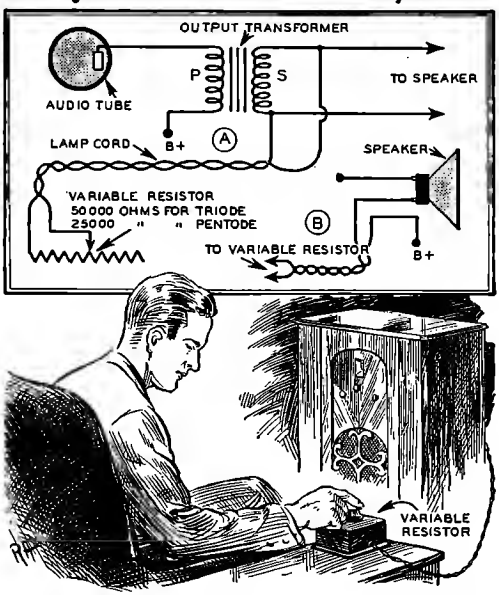
Receivers using a triode (three element) tube as a final audio call for one method where an output transformer is used to the speaker. With no output transformer, a different method is used.

Sets with an output transformer should have a variable resistor across the secondary as a volume control, as illustrated in circuit A. This can be housed in a neat little box on the table beside the chair and connected across the transformer secondary as shown. Use No. 18 twisted lampcord laid under the rug and you will have a handy and useful arrangement.

For a triode tube use 50,000 ohms and for a pentode tube use 25,000 ohms.

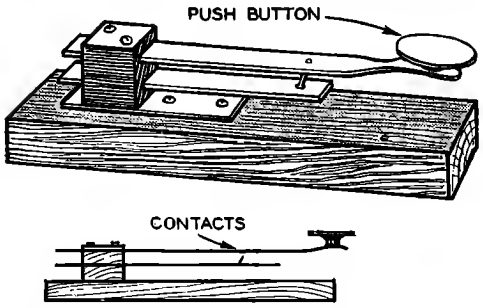
For sets without output transformers the resistance is merely connected in series with one side of the speaker cord as shown in circuit B.

The control cabinet should be padded to prevent scratching of the table or stand.



Variable resistor, hooked into circuit as shown, reduces volume so that music or voice will not deafen listeners.

Key for Buzzer Practice Set Made From Old Phone Jack



Mount the old phone jack on a baseboard as illustrated here. Saw off lower part which holds the opening for plug.

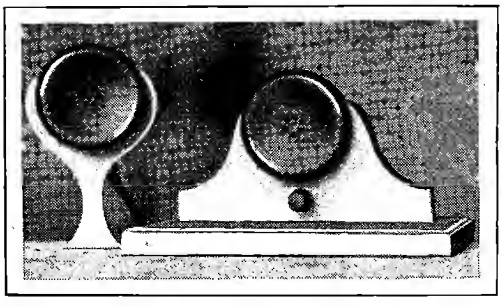
AN OLD phone jack mounted on a baseboard as illustrated at the left makes an excellent key for use with a buzzer practice set. A poker chip or large button glued or bolted to the tip will do duty as a knob. Careful adjustment of the contacts will give you a nice smooth touch and teach you how to handle a real key when you go on the air.

Home-made Mike From Head Set

A MINIATURE "mike" which gives surprisingly efficient service can be constructed at little cost from an ear piece taken from an old set of head-phones. This can be mounted in any convenient or artistic way, as illustrated below.

In hooking up the microphone for use with your radio attach one of the wires to the grid prong of the detector tube and ground the other. The regular ground for the set can be used for this. All the connections should be fastened tightly or soldered to reduce interference noises.

This home-made "mike" will give very satisfactory results, and will prove very amusing and entertaining. A cut-out switch installed on the mounting base enables the "announcer" to turn the "mike" on or off for his home program.

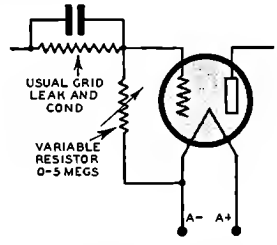


Mike made from head phones may be mounted as shown.

Two Way Grid Leak for SW Work

WITH the arrangement shown here you may be able to boost efficiency of your grid circuit. From the grid side of the leak install a 0-5 megohm variable resistor, bringing it down to the grid return. By removing the leak across the condenser you get the effect of a grid return leak, or by closing the variable leak to 0 you get the effect of the regular leak and condenser combination. You can also use both together.

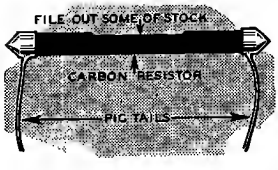
Note that the remaining side of the 0-5 megohm variable resistor hooks to the negative side of the filament. Make sure that this connection is correct before final test.



Circuit for hooking up the two-way grid leak for S. W. circuit.

Increasing Resistance of Carbon

HERE'S a simple way to increase the resistance of a carbon resistor in an emergency. With a wide file gently file down a flat place in the carbon, testing the resistance every three or four strokes with an ohmmeter. The more carbon that is removed, the higher the resistance becomes. A few strokes may be sufficient.

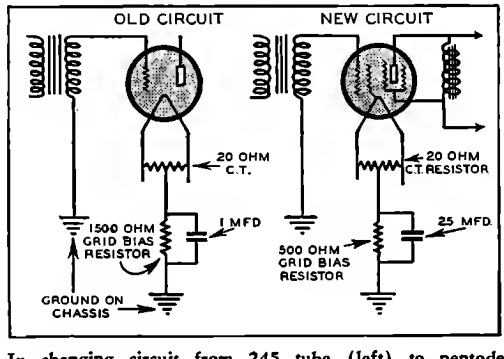


Raise resistance by filing out part of carbon, testing with meter.

Replacing 245 Tubes with Pentodes

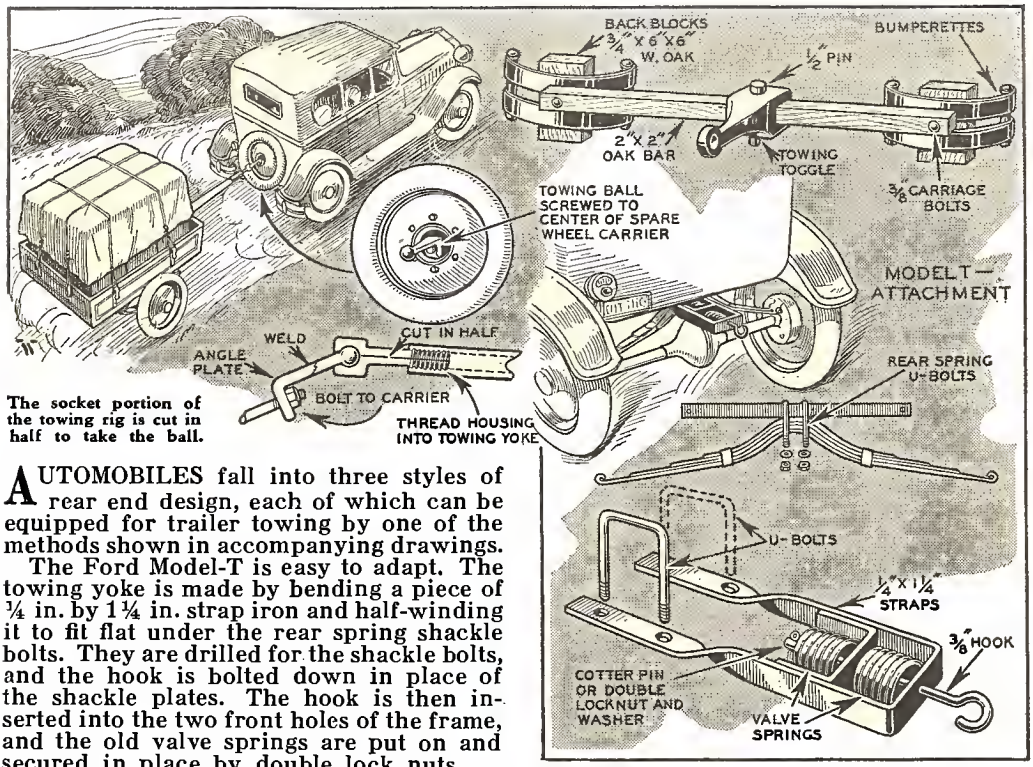
ARE you getting a bit tired of the old set using a 245 audio tube? For more volume and better tone you can replace it with a 247 pentode with but a few changes.

Note the two diagrams below. Use the same filament circuit, but instead of a 1500 ohm grid bias resistor use one of 500 ohms, and substitute a .25 fixed condenser for the 1 mfd used with the 245. If you use a socket adapter for the 247 buy one with an iron core choke contained in its base. Otherwise you will need one of about 15 henries to shunt across between plate and screen. The screen, by the way, takes the same voltage as the plate, namely 250.



In changing circuit from 245 tube (left) to pentode (right) change resistor and condenser in filament circuit.

Trailer Attachment for All Makes of Cars



The socket portion of the towing rig is cut in half to take the ball.

AUTOMOBILES fall into three styles of rear end design, each of which can be equipped for trailer towing by one of the methods shown in accompanying drawings.

The Ford Model-T is easy to adapt. The towing yoke is made by bending a piece of ¼ in. by 1¼ in. strap iron and half-winding it to fit flat under the rear spring shackle bolts. They are drilled for the shackle bolts, and the hook is bolted down in place of the shackle plates. The hook is then inserted into the two front holes of the frame, and the old valve springs are put on and secured in place by double lock nuts.

For cars having no place but the bolt on the rear tire carrier, a very effective and simple hook can be made from an old ball and socket rigging, such as from the steering gear of an old car or the wishbone radius rod of an old Model-T Ford.

Cars having bumperettes may be adapted as illustrated in drawing in the upper right hand corner. The 2"x2" white oak bar is held in place by a pair of back blocks, anchored firmly with carriage bolts. Any kind of towing toggle may be employed. All these attachments have been used on loads up to 1600 lbs. on a 4-wheeled trailer.

Towing yoke for Model-T Ford is drilled to take the shackle bolts. The valve springs take up shock of starting.

Dispenser for Soldering Paste

Squeezing the toothpaste tube applies solder paste to metal.

A HIGHLY convenient container of soldering paste may be made by cutting off the end of an old tooth paste tube and filling the latter with the paste. The bottom of the tube is simply folded over after the tube has been filled. Squeezing lays a line of paste.

Repair Honeycomb Radiator Leak

THE simplest and most effective way to repair a leak in a honeycomb radiator is first to remove the radiator from the car and clean the surface at and around the leak. Next coat the cleaned surface with soldering flux, then whitewash the radiator around the leak, but not over the part which has been cleaned. Place the radiator in a slanting position, and slowly pour solder over the cleaned surface. The solder will adhere to this surface, closing the leak, but due to the coating of whitewash it will not adhere to the surrounding surface. This method is generally considered better than using a soldering iron as it prevents accidental overheating.

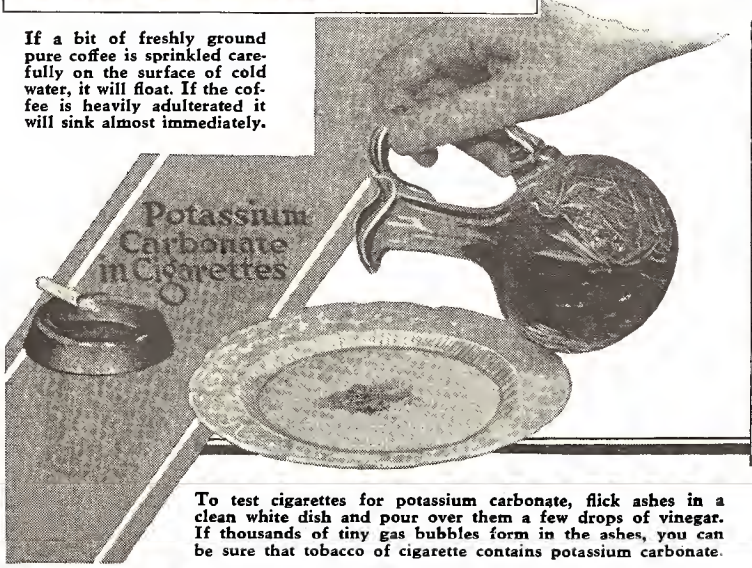
Apply whitewash around spot to be soldered as shown here.

Test What You Buy to Get Money's Worth

Dentists will tell you that toothpaste with grit in it will soon wear the enamel off your teeth. To test for the presence of this harmful ingredient, place a bit of the paste on a glass plate and run the flat side of a razor blade over it. Abrasive materials are felt through the fingers.

If a bit of freshly ground pure coffee is sprinkled carefully on the surface of cold water, it will float. If the coffee is heavily adulterated it will sink almost immediately.

Ice cream is often adulterated with starch. If melted cream is placed in glass with iodine, purple color will indicate presence of adulterant.



To test cigarettes for potassium carbonate, flick ashes in a clean white dish and pour over them a few drops of vinegar. If thousands of tiny gas bubbles form in the ashes, you can be sure that tobacco of cigarette contains potassium carbonate.

Gasoline may be tested by immersing in it a bright copper coin, which becomes highly discolored in an hour if sulphur compounds are present.

It's Easy to Make Photostatic Copies With Your Camera

Prism holder fits over the camera lens as shown at the top. Below is seen illustrated method of focussing.

VERY often it is desired to make a copy of some document or other printed or typed sheet. If you have no regular photostat camera the only other means at your disposal will be to photograph the sheet or page with a process plate or film, and then print it on ordinary photo printing paper. This is a long and relatively expensive procedure.

All that is necessary to convert your cut film camera into a photostat apparatus is a prism, which is placed over the lens to reverse the image. For a small camera the prism from an old pair of binoculars will serve the purpose.

Make a tin hood to fit over the prism, leaving open the two faces which meet at a 90° angle. Paint the inside of this black or paste black paper in it, and fit the prism inside. Now you can either make a tin ring to fit over the lens, or, if you happen to have an old ray filter, use the metal ring. Solder the hood onto the ring as shown in the photo.

With this small attachment you can instantly convert your camera into a photostating apparatus. Simply load the cut film holder with bromide paper. Set the camera level and place the sheet to be copied below as shown in the illustration. You will have to determine by experiment how long the exposure should be.

The picture or document to be copied should be thumb-tacked to a sheet of plywood or other smooth board, making sure all "hills' are removed.

Photoflood Light for Indoors

EIGHT photoflood globes grouped inside an octagonal frame make this lamp the equal of an arc light for the home photographer, permitting snapshots of 1/65 second in dark room, with lens opening F 4.5.

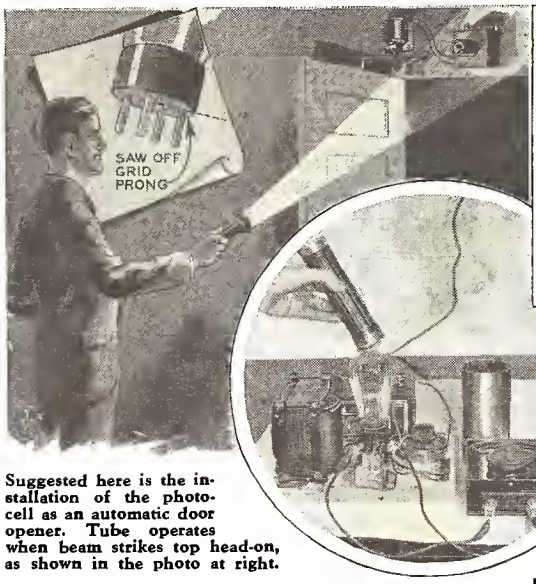
The frame pieces are held together with splines glued in one end only, and four screws from a plywood back. They can be taken apart in a minute, to use the lamps strung out singly or in groups. When wiring, therefore, leave a little slack between sockets, for this purpose.

Cut the reflector gores from cardboard, join them with strips of cloth glued on, and glue the assembly inside the back. After fireproofing with a coat of waterglass, finish with two coats of aluminum paint, and mount the reflector on a bracket with a bolt to slide in the standard slot.

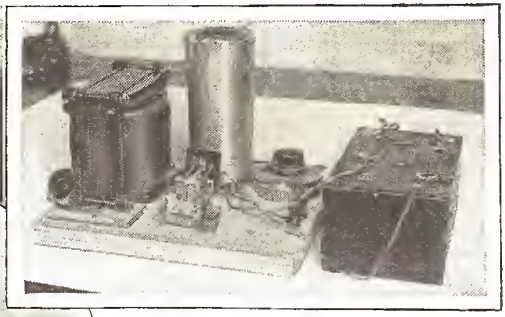
With a lens stop of F 7.7 (U. S. 4), give these exposures for par-speed film: Lamp at 3 ft. from subject, 1/10 second; 4 ft., 1/5; 5 ft., 2/5; 6 ft., 3/5; 7 ft., 1; 8 ft., 1 3/5. If the room is fairly light, shorten exposures by one-third.

Mount photoflood lamps in reflector, as shown, to concentrate light on object. Light is equal to that of arc flame.

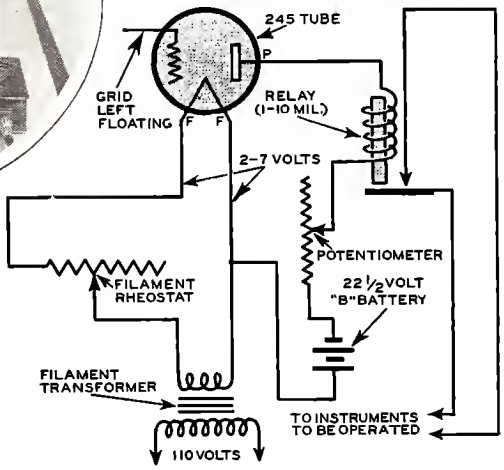
Ordinary Radio Tube Makes Electric Eye



Suggested here is the installation of the photo-cell as an automatic door opener. Tube operates when beam strikes top head-on, as shown in the photo at right.



Here is the electric eye assembled on bread board ready to go into operation. Can covering tube has top cut out to admit light rays.



Circuit for electric eye. Note that grid is left unconnected.

THANKS to the intensive research of Mr. W. P. Koechel, of Owensboro, Kentucky, a surprising photo-electric effect has been discovered in ordinary radio vacuum tubes. To electrical experimenters this will be good news, because it means that photo electric cells can be devised from inexpensive radio tubes.

It has been found that the 210, the 245 and the 250 tubes are photo-electric to a marked degree, and that the light response is sufficient to trip a cheap relay.

Tubes which give the best results are those having open or clear tops so that light from external sources may reach the grid. It is essential also that the grid prong be cut off as illustrated above.

A circuit is given at the top of the page. The filament voltage, you will notice, is regulated by a power rheostat in the secondary of the transformer circuit. The experimenter will have to discover the best filament voltage by tests.

The relays used in connection with these new photo-electric cells should be capable of operating on a range between 1 to 10 milliamperes. MODERN MECHANIX AND INVENTIONS editors will be glad to give you the address of manufacturers of relays.

When operating the tube, remember that the more light that reaches the grid of the tube, the greater will be the current output. Therefore it is advisable that the tube be installed in such a position that the beam strikes the top head-on, as illustrated in an accompanying photo.

The vacuum tubes will be found unduly sensitive to body capacity, so it will be necessary to cover the tube with a metal shield, which is grounded to the negative filament. The top of the shield is left open.

Model Battleship from Hardware

AN UNUSUAL battleship used in a window display has attracted much attention for a California hardware man. The entire ship is made of items in the store. Six-foot saws form the sides of the vessel, while fish reels, fish poles, shot gun shells, mouse traps and hose nozzles are used to form the deck fixtures and superstructure.

Saws, fish reels, poles, mouse traps, etc., form model ship.

MAKING YOUR OWN

The sheet zinc plate, after careful burnishing, is coated with sensitized solution. A printing is then made on the metal as with an ordinary photograph. A strong electric light is used for printing; in the case of an arc light an exposure of about eight minutes will be necessary. Daylight can also be used though here the exposure will vary from one to ten minutes. The background is cleaned off by drawing a wad of wet cotton over the surface, after applying a very thin coating of printer's ink.

Chemistry is always fascinating when your experiments bring practical results. This article describes a process used in making the line cuts used in illustrating how-to-build articles in this magazine and shows you just how you can make them yourself for your own printing.

EXPERIMENTERS who enjoy dabbling with chemistry and photography will find the making of zinc etchings—photo line-engravings—a pleasant and lucrative hobby. After some hours spent in mastering the rudiments you can soon learn to make printing plates for your own letterheads and hundreds of other things with the advantage that the designs are strikingly original and different from matter set in type. If you have an aptitude for drawing, your sketches can be easily made into metal from which as many copies as you wish can be printed.

If you are not artistically inclined, follow the method described below and you can make excellent drawings of any subject with the aid of your kodak.

In making the plate shown in the illustrations, a photograph of a girl was used. This was enlarged to 8x10 size.

Line Photograph with India Ink

Place the photograph on a flat surface and commence the drawing by going over the outline with a pen and India ink. You should have a fine pointed and a broad pointed pen at hand; the former for shading in the delicate lines, the other for the more solid lines; and a pointed brush for filling in the completely black portions.

After the figure is outlined, use the broad pen and do the dark portions. Where there are shadows, shade in the portion with fine lines drawn closely together.

When the photograph is completely lined with the India ink, it is allowed to dry well and then immersed in a solution made by dissolving a negative reducing powder in a small quantity of water. The reducer will slowly eat away the silver of the photograph, leaving your drawing on a white background. This should be rinsed well and dried, when any portions you neglected can be touched up with a pen.

Now make a negative of the drawing with your kodak. Give a normal exposure, and in developing the negative use a pinch of potassium bromide to keep the lines clear. It should be somewhat overdeveloped to acquire density. You now have a negative for printing on zinc, and the next step is to prepare the zinc.

A piece of heavy sheet zinc is cut slightly larger than the negative, and one side thor-

Zinc ETCHINGS

by K. B. MURRAY

oughly polished with water and pumice powder until it acquires a silver brightness. It is then washed and polished with a dry, clean cloth.

Beat up the white of one egg in a graduate and add to it two ounces of distilled water. In another ounce of the water dissolve ten grains of bichromate of ammonia; this solution is stirred into the egg white solution. Add six drops of strong ammonia water.

This makes a slow-acting sensitizer for the zinc plate. The coating should be done with yellow light for illumination.

Applying the Sensitizer

Flow a small quantity of the sensitizer over the bright side of the zinc plate, allowing it to drain off from one side. A second time the sensitizer is flowed over the plate. Any air bubbles should be broken with the flat side of a toothpick. Drain off the surplus and hold the plate over a source of heat, preferably gas or electricity. Retaining it at an angle so that the surplus solution will flow off, gently blow on the plate. It will dry in a minute. At no time should the plate be heated more than the hand will bear.

Place the negative in a printing frame, and the sensitized zinc plate on top of it. Exposure to a strong electric light, such as an arc light, is necessary for about eight minutes; with daylight, from one to ten minutes.

The exposed zinc is removed to the yellow light and given a very *thin* coat of printer's ink with a roller. Then place it in a tray of water and after a minute draw a wad of wet cotton over the surface. The background should come away, leaving the black inked lines of the drawing on the shining metal. If the entire coat of ink comes away, the exposure has been insufficient; if the background refuses to leave the plate, the exposure has been too long. In either case of wrong exposure, the plate can be repolished with pumice and the exposure repeated after sensitizing.

When you have the exposure right and the background and space between the lines of the drawing are clear, shake off the surplus water and dry the plate by blowing on it over a slight heat.

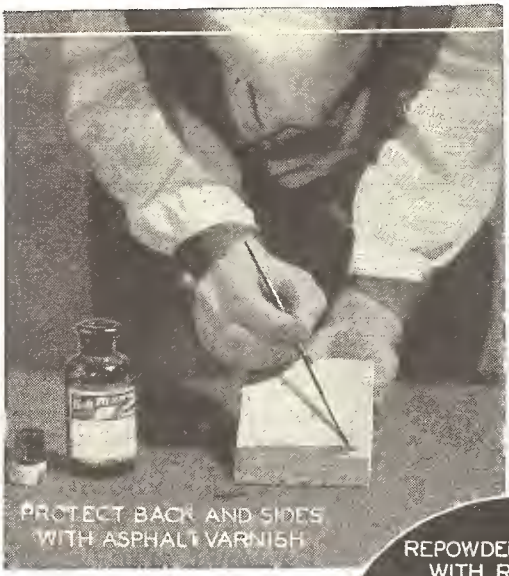
Proceeding With the Etching

When the plate is dry, it is dusted with a resin powder; ordinary resin can be used, or the resin known as Dragon's Blood, which is a red powder. Brush off the surplus not adhering to the inked lines, and heat the plate until the resin melts and becomes glossy. The back and sides of the plate are then coated with asphalt varnish.

The etching solution consists of thirty parts water and one part strong nitric acid, which is handled carefully. It is placed in an enamel or glass tray; the plate dipped in water, then into the tray, where it should

The printer's ink protects raised or exposed parts of plate. Dragon's Blood (powdered resin) is then dusted on, protecting printing surface from the acid etch. The etching is done in an enamel or glass tray and the work is done by strong nitric acid diluted with 30 parts of water. Extreme care should be used in handling the acid. Too strong a solution will result in undercutting or etching away of the finest lines in the drawing.

Directions for Etching the Plate



The back, sides and printing portions of face are protected with asphalt.

rest on the bottom, face up. Place a pencil midway underneath the tray so that it can be easily rocked, flowing the acid solution back and forth over the plate.

The parts of the zinc not covered with resin or varnish will dull and small bubbles of hydrogen form. These should be removed frequently with a flat brush, which also brushes away the oxide formed on the exposed zinc.

Undercutting, or etching away of the finest lines, is caused by too strong an acid. Therefore the fine lines should be watched; if they commence to be etched away, the plate is removed from the tray, rinsed in pure water, and the fine lines retouched with a fine brush and the asphalt varnish.

When the etching has proceeded to the depth equal to the thickness of a calling card, it is removed, washed and dried for re-powdering. The plate is held in a vertical position, resin powder flowed over it, and the excess removed with a soft brush held in a right-angle position to the plate. The edges of the etched portion will hold the resin. The plate is then heated to melt the latter. When cool, another side is treated in the same manner, until all four sides of the etch, or "bite" as it is called, have been protected by the resin.

Now return the plate to the acid bath, which may this time be strengthened by the addition of another ounce of pure nitric acid. Etching is continued with until the fine lines again show danger of being undercut.

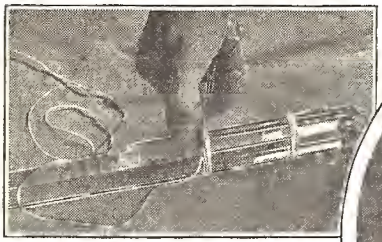
By this time the depth of the etching will be sufficient so that the lines of the drawing may be gone over with asphalt varnish on a brush to entirely protect them from action by the acid. On returning the plate for further etching, the acid should be further strengthened so as to eat deeply into the background and broad spaces between the lines. When these broad spaces have been eaten away to half the thickness of the zinc, the operation is completed. The plate is washed with benzine to remove all varnish and resin, when it is ready for trimming and nailing to a block of wood that will bring it up to type height.

If you do not have a small printing press available and do not wish to go to the expense of having your cut printed, good reproductions can be had by the following method:

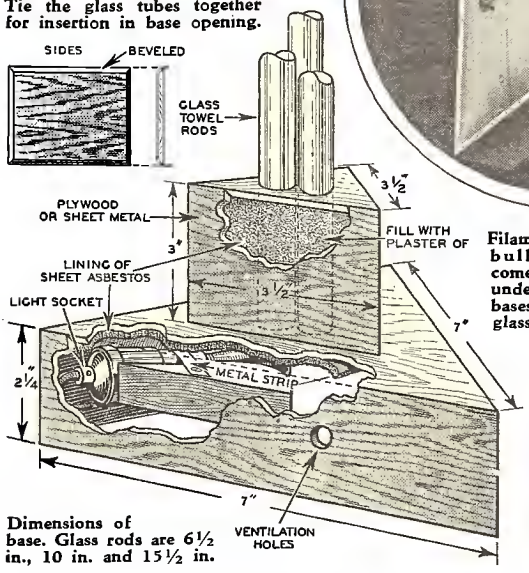
The etching is placed on a solid surface and inked with regulation printer's ink. The paper to be printed is placed face down on the etching. A block of wood covered with several thicknesses of fairly soft fabric is placed on the paper and tapped with a mallet. This transfers the inked impression to the paper. Frequently plate and paper can be run through the rolls of a washing machine wringer, in which case the plate need not be mounted on wood. Use this method for printing linoleum blocks.

The asphalt is acid proof and only the parts it is not on are eaten away by the acid etch, which is a 1 in 30 solution of nitric acid. Progress of the etching in the acid bath must be closely watched to prevent eating away the fine lines in the solution. Usually three separate "bites" are necessary to complete the job, the solution being strengthened each time, particularly in the final bite when the undesired background is being removed.

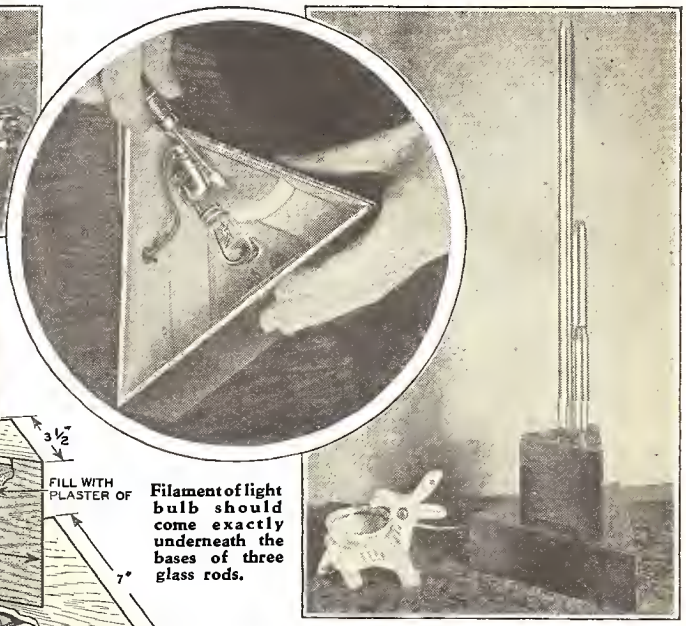
Unique Glow Lamp Last Word in Novelty



Tie the glass tubes together for insertion in base opening.



Dimensions of base. Glass rods are 6½ in., 10 in. and 15½ in.



Filament of light bulb should come exactly underneath the bases of three glass rods.

Modernistic and unique, the glass rod lamp makes an attractive ornament for library table.

AN INTERESTING lighting ornament for the table is a glow lamp that you can make from a few lengths of glass rod, some plywood, a candelabra socket and lamp, and a few other odds and ends. The lamp consists of a base for supporting the glass rods (Pyrex or towel) in an upright position, and for housing the miniature lamp which is placed directly beneath the lower ends of the rods.

Rays from the filament are confined largely within the rods by internal reflection, and illuminate any small bubbles or other imperfections in the glass. Ends of the rods glow in a weird manner. Designs ground or etched on the surface stand out strikingly.

Group the rods together and tie them with cord or tape. Then cut, in top of the base, an opening conforming to the cross-sectional form of the group of rods. Slip the rods into place, invert the lamp, stuff cotton around the glass and into all spaces between rods, and pour plaster of Paris, mixed to a thin paste, around the rods. Let it set for an hour or two before moving the lamp. Then mount the socket so that the bulb, when screwed in place, is directly below the rods. Be sure that the rod ends are free of plaster.

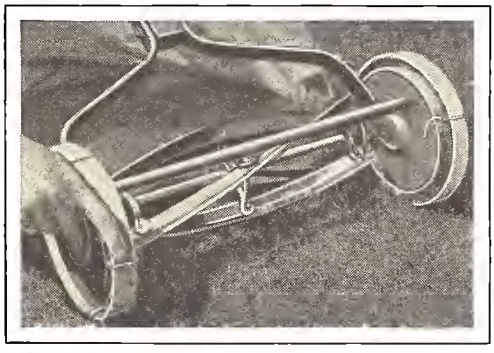
Data on the lamp illustrated are:

Rods—three pieces ⅝ in. in diameter and 6¼, 10 and 15½ in. long respectively, of which 2 in. is imbedded in plaster.

Socket—candelabra, brass, with a pull-chain switch that is not necessary. Lamp—5-watt, 115-volt G. E.

Skid Chains for a Lawn Mower

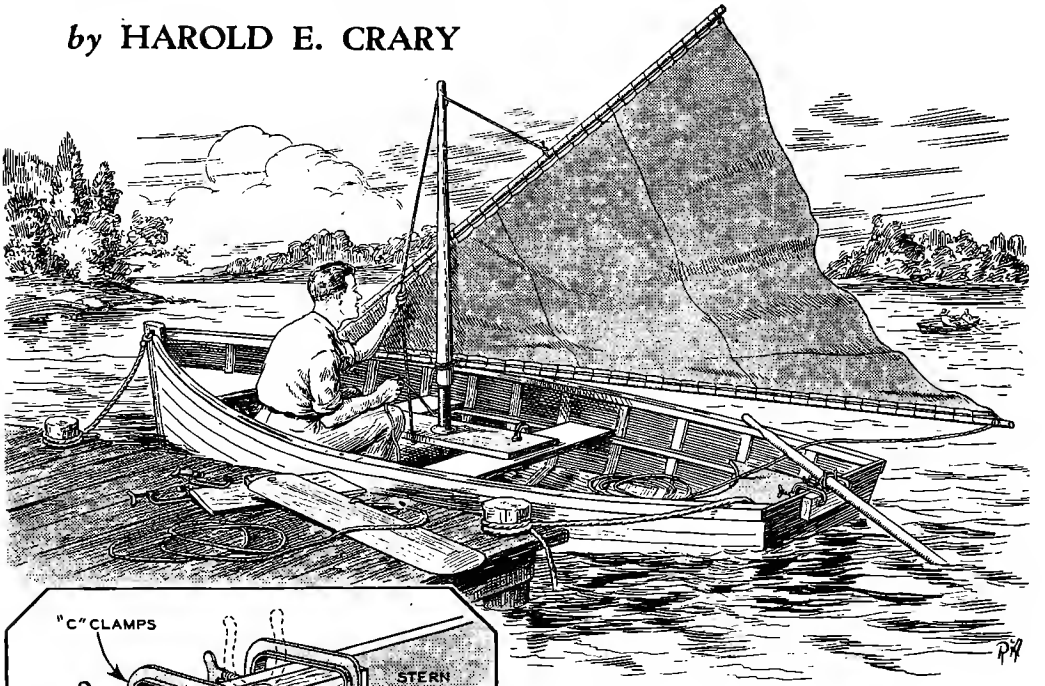
IF YOU have been assigned the job of keeping the lawn of your home mowed, you will no doubt agree that the skidding qualities of the lawn mower wheel prove quite trying at times. There's a remedy for this difficulty, however, and that's to equip the wheels with skid chains in the form of a rubber band from an old inner tube. These strips are applied as illustrated below and are secured firmly to the wheel with short lengths of wire, twisted underneath the rim.



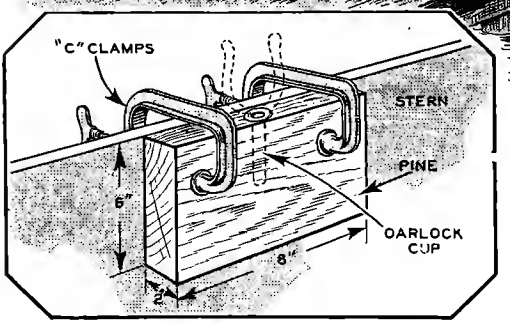
Rubber "skid chains" are bound firmly on lawn mower wheel.

This Portable Sail Rig Will

by HAROLD E. CRARY



This shows how the oar is kept in the oarlock to act as a tiller. Here for once the kind of oar which has a pin through it is worthwhile. The other elements of the outfit are shown disposed in their proper places with the leeboards ready to put on and balance for proper position.



Small "C" clamps are used to fasten the tiller block to the transom of your rented boat. The steering is done using an oar in an oarlock for a tiller. Old seagoing practice!

FOR twenty years, since the age of six, I've been building and sailing boats. My first was an eight-foot covered deck job with a wrap-around tarp over the cockpit, and carried only ten feet of canvas. Since then I've sailed everything from a ten-foot Kayak to a forty-foot smack. At twelve I rode out a white squall on the St. Lawrence with eighty-foot of canvas over an eleven-foot canoe. In other words I like boating, and I like your mag because you give us boat fans a break now and then.

I'm very proud of my portable sailing rig, which I made last summer, and used very successfully. I got a big kick out of listening to the wisecracks of the hangerons at the liveries where I hired a rowboat. When I started to unload the tackle from the fliv, they started in wisecracking about "sailors." Their laughter continued until I had clamped the six clamps, and cast off the stern line. But when they saw the boat dart away from the dock, and thread through the traffic, out into the open bay or lake, they didn't laugh any more. If, for any reason, I came back to the wharves before "quitting time" I would receive any number of offers to take on a passenger or two. And the gobs who hired a boat and then spent the rest of the afternoon pulling their arms off rowing around—I've got my opinion of them, when, for ten bucks or twelve at the most, they could build a rig like mine, and sail away.

Three Parts to Rig

So gather 'round you Volga Boatmen, and give a listen. Here's something new in the boating world. A portable sailing rig, which may be attached to any rowboat, even the kind you rent at a boat livery. It's inexpensive, easy to operate, and safe. Best of all, it works.

There are three separate parts to it. The first is the sail tackle. It consists of a triangular sail, two spars, a mast, and a bucketboard. The second is the leeboard arrangement, which takes the place of a centerboard. The leeboard proper is bolted to a block, with a single kingbolt. The block in turn bolts to a sideboard, with four small bolts. Between the block and the leeboard proper is a ball-bearing fea-

Sail Any Rented ROWBOAT

ture, found on no other leeboard I know of. The third item of your rig will be a steering block. This is merely an eight-inch length of two-inch pine, six inches wide, with an oarlock cup set in one side. Various bits of rope and line complete the tackle.

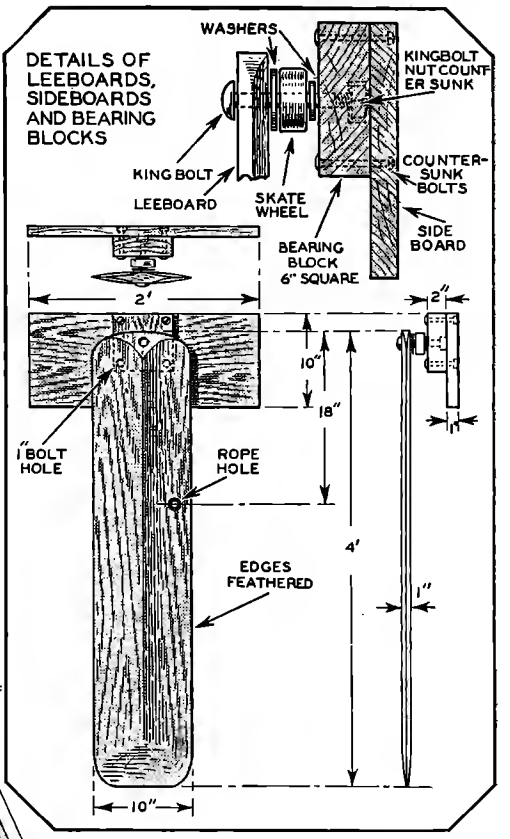
The sail is triangular, as I said. It is twelve feet on the bottom edge, ten feet high, and twelve feet on the "hypotenuse." It is hemmed on the two twelve-foot sides, and a grommet is placed in each of the three corners. The canvas should be doped to prevent mildew. It is cheaper in the long run to have an awning or tent company make up the sail itself, because they do a better job than you can hope to.

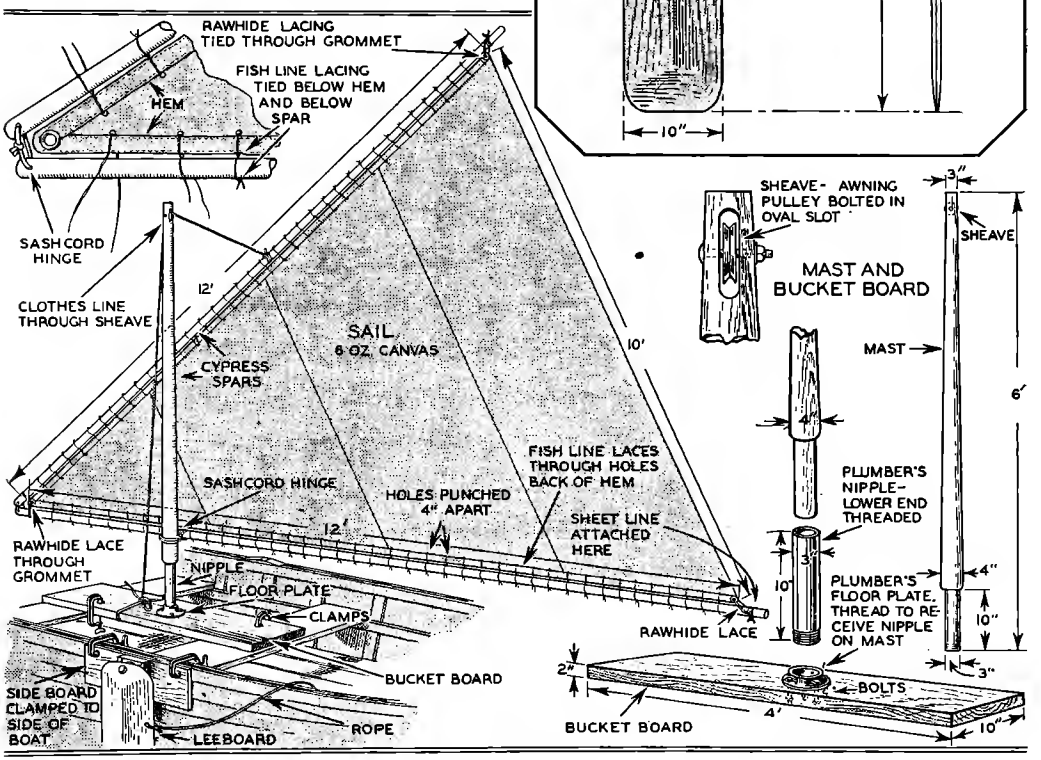
Shaping the Cypress Spars

The spars are cypress, twelve feet six inches long and an inch and a half square. Round the corners and edges with a plane, and then bore a half-inch hole about two inches from the end, on each one. Connect one end of the spars together with a loop of sashcord, so that they are loosely hinged together. The two ends should be about two inches apart when the loop is knotted.

Lay the canvas flat on the ground, and punch holes, just back of the hem on the

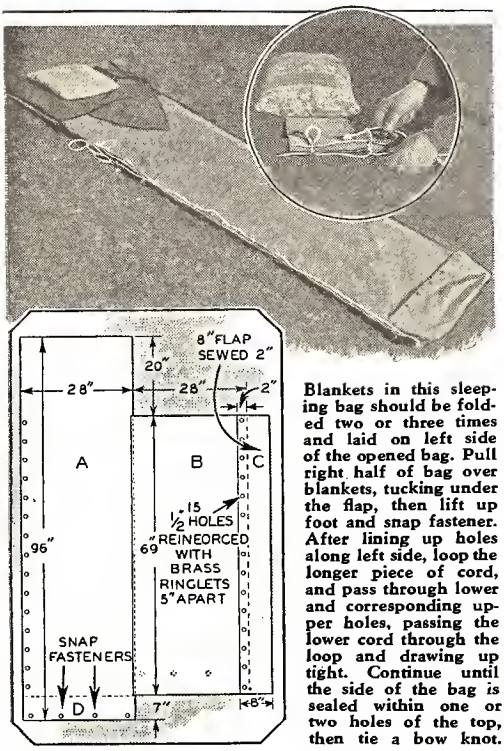
(Continued on page 132)





Here are Figs. 1, 2 and 3. They show the dimensions of the sail and show how to lash it to the spars. Also the construction of the "Bucketboard" (having a bucket for the heel of the mast) is clamped on. Leeboard details shown above.

Sleeping Bag Is Last Word in Comfort and Compactness



Blankets in this sleeping bag should be folded two or three times and laid on left side of the opened bag. Pull right half of bag over blankets, tucking under the flap, then lift up foot and snap fastener. After lining up holes along left side, loop the longer piece of cord, and pass through lower and corresponding upper holes, passing the lower cord through the loop and drawing up tight. Continue until the side of the bag is sealed within one or two holes of the top, then tie a bow knot.

FOR him who follows the forest trails summer or winter, a sleeping bag is not only an added comfort but also a necessity. A practical camper with a lean purse can design a bag like the one illustrated which is not only light and compact but is adaptable to any change in climate.

Approximately 36 square feet of medium weight canvas, 30 sets of brass reinforcing ringlets, three or four snap-fasteners and a 21 ft. sash cord are all materials required.

First lay out the 96 and 69 in. lengths of canvas, as illustrated in the accompanying drawing, then punch the holes according to instructions given. When the bag is folded along the vertical seam the holes on both sides must coincide. Snap fasteners are sewed on the bottom.

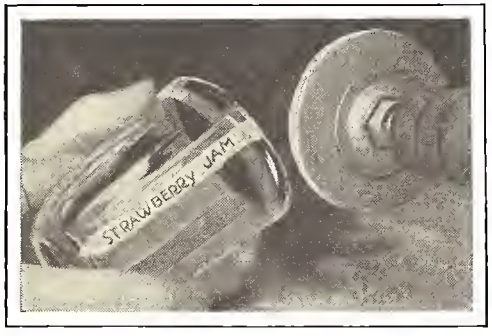
Next sew an 8-in. strip, 69 in. long, to the underside of the right hand flap, 2 in. from the edge. This flap slips under the folded blankets to keep the bag cold-proof and the blankets clean.

Knot a 21-ft. sash cord to the lower left ringlet of the bag so that one length is 9 ft. and the other 12 ft. Now you are ready to fold in blankets as told under photo.

Simple Stunt for Writing on Glass

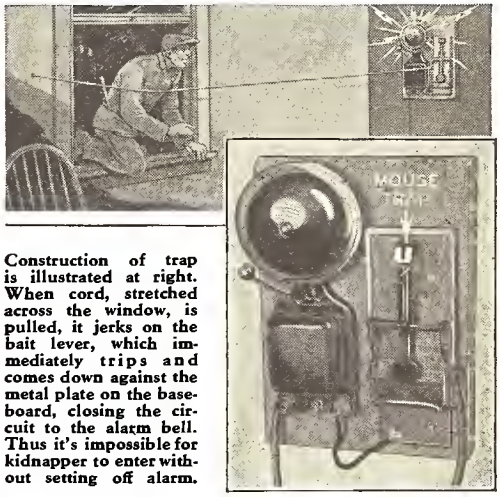
ANY home mechanic who has a power-driven grinding-wheel may help his wife make a set of jelly glasses which, in place of carrying stickers for marking, may carry ordinary pencil marks made directly on the glass.

If the grinding wheel is a fine one and travels at high speed, the glass is simply brought in contact with it. The wheel will quickly grind all of the finish off, leaving the surface in such a roughened condition that it will take ordinary pencil marks. A graduated scale can also be marked on jars for measuring convenience. Only a narrow strip need be ground down side of glass.



Name of contents of jar is inscribed on part of glass roughened by grinding against wheel, as illustrated here.

Nursery Alarm Scares Kidnappers



Construction of trap is illustrated at right. When cord, stretched across the window, is pulled, it jerks on the bait lever, which immediately trips and comes down against the metal plate on the baseboard, closing the circuit to the alarm bell. Thus it's impossible for kidnapper to enter without setting off alarm.

THIS sure-fire burglar alarm, installed in the nursery at a cost of only a few cents, may prevent a tragic kidnapping. The drawings above illustrate construction and assembly. When a potential kidnapper enters the window he runs afoul the invisible thread, thus tripping the lever and closing the circuit to the bell. Contact is made between the metal arm of the trap and a small copper plate on the baseboard to switch on the bell.

Black thread should be strung across the window, since it is less visible than any other color. The end should have a hook so the thread can be taken down.

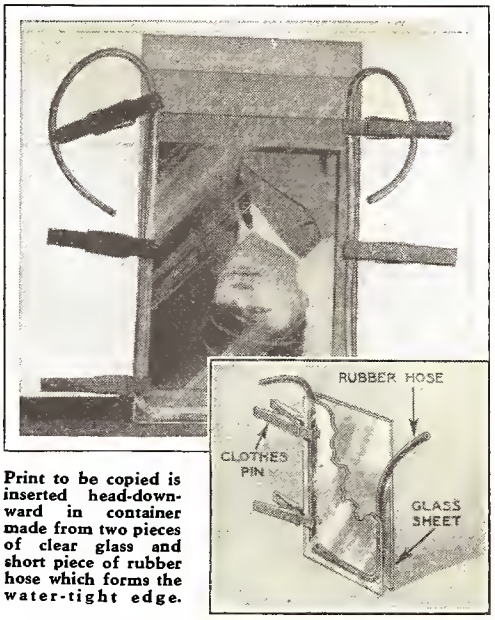
Simple Kink Makes Clear Copy of Rough Surface Photos

LINEN or rough surface photographs may be copied by a method that gives a perfect photograph without showing lines or rough stipple surface.

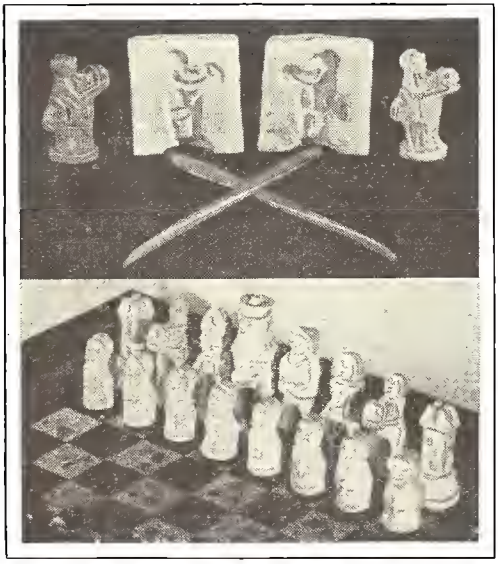
The procedure is as follows: Take two pieces of clear glass, one piece at least two inches longer than the other one. Put a small rubber hose around the edge and between the glasses, as illustrated in the accompanying photo. Fasten the glasses together with clothes pins or paper clips. The hose may be bought at any ten cent store or a piece of old hose from a camera shutter will do as well.

Fill the space between the glasses with a solution of one-half glycerine and one-half distilled water. Be certain that it is distilled water. Place the photo to be copied down in the solution and copy it.

After copying, the glycerine is easily washed from the print and does not injure it in any way. Curve the loose ends of the hose around the edge of the longer glass and pour solution in a bottle where it may be kept for future use.



Print to be copied is inserted head-downward in container made from two pieces of clear glass and short piece of rubber hose which forms the water-tight edge.



Above, clay models and moulds made from them. Below, completed figures, with felt bottoms for smooth moving. A clear varnish makes an excellent finish for the figures.

Make Your Own Novel Chess Men

CHESS players who find monotony in conventional sets may easily turn out chess men of their own unique and distinctive design, to suit their individual fancy.

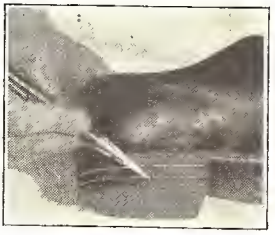
First, the models must be cut from blocks of clay in fitting sizes for the six types of pieces. This done, the moulds are poured for each individual piece. This step employs a small cardboard box, open at the top. Now paint the model and the inner walls of the box with some light liquid grease, then place the model in the center of the box, mix plaster, and pour it into the box until the model is wholly covered.

After half an hour break the walls of the box away and cut open the block of plaster into two pieces, using an old razor blade. Remove the clay model, then brush the mould clean and grease it. With a rubber band, bind the half-moulds together.

Finally to make the pieces, mix plaster and pour into the mould, tapping to eliminate bubbles. Let harden for half an hour, then open mould, remove men and clean.

New Heels For Shoes From Two Pairs Old Heels

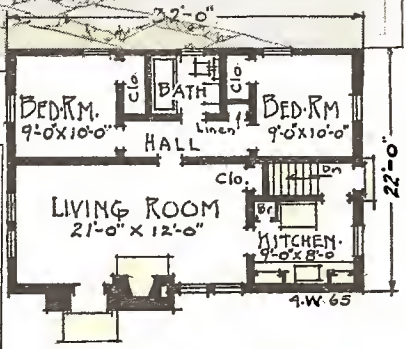
OFTTIMES the home mechanic will find that he can equip an old pair of working shoes with new rubber heels by the simple expedient of salvaging the worn down heels of two pairs of discarded shoes. These salvaged heels should be split in half with a very sharp knife kept wet with water. This done, the heels are then tacked in place to form a heel of standard height, as illustrated in the accompanying photo. It will be found that this procedure will turn out a very neat and substantial job. Of course, if the old heels are worn too far down, they will be unsuitable. Leather heels may be built up by using the same procedure as above.



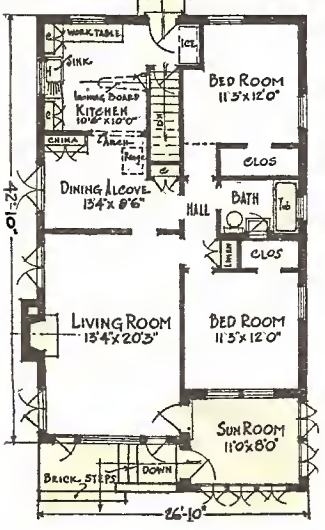
Build up the heel from two rubber half-heels from old shoe.

Last Word in Houses—the "Bungalette"

Ideal for the family of three or four people is this English type four-room bungalow No. 4-W-65. There's no formal dining room but you can set a table in living room. Sun porch can be added for more room.



Above are floor plans for the English type bungalow, 4-W-65. Note how the kitchen gives into the living room. Approximate cost $3500.

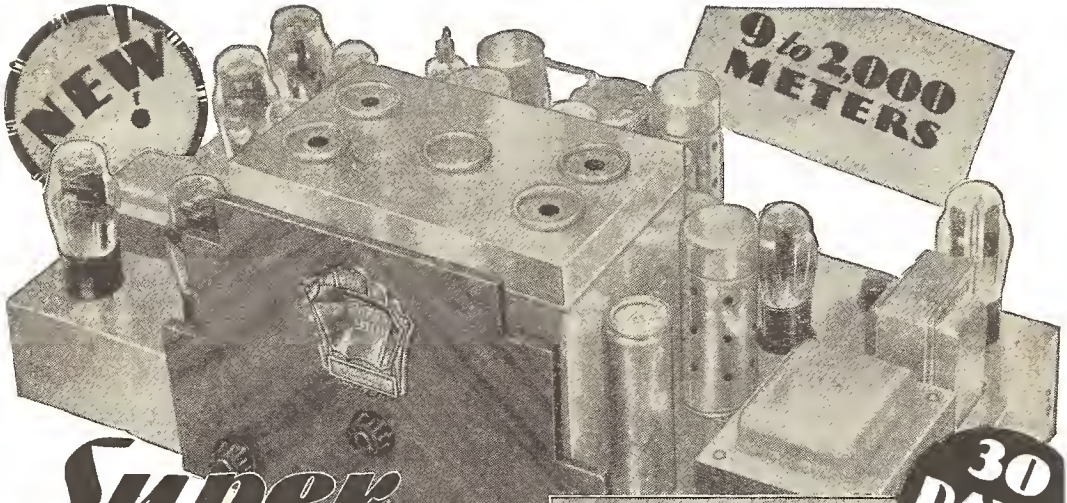


Above home No. 5-Bv-27, a low, snug-fitting house built close to the ground. Floor plans are at left. For complete blueprints of the houses illustrated on this page send $1.00 to Modern Mechanix Home Building Editors, 529 So. 7th Street, Minneapolis, Minn. Two new plan books, "Homes for Newlyweds," containing 32 of latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses," containing time, space and labor saving bungalows, may be had for 15c each, or both for 25c, from MM Home Building Editors.

OUT of the depression has come the need for compression. We have had to do with less and be happy about it. But long before the depression an army of home-makers, housewives, were asking for less space in houses and space more efficiently planned. In other words they wanted and still ask for more space in less room.

That's one reason why the small kitchenette apartments came into favor. That's why one room may now be planned to do the work of two and often three. But above all that's the reason for these "bungalettes," which are nothing but small compact houses in which every inch of space is often used to triple advantage.

Two bungalettes illustrated here are typical of the newer types. Plan 5-Bv-27 is a low, snug-fitting house close to the ground, with its horizontal lines rather severely accented and in keeping with the general *(Continued on page 127)*



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Belgian Congo, New Zealand, stamps depict their natives at work and play.

On the Belgian Congo stamp you get a fascinating glimpse of life in the African bush, while on the New Zealand stamp you are shown the aborigines at their favorite pastime.

Africa is fruitful in such stamps, and is thus a favorite hunting ground for collectors.

Strong Agitation for U. S. 15c Piece

WITH inflation looming large on the economic horizon, numismatic fans will be interested to learn that strong agitation is afoot for a United States silver 15 cent piece.

Reason: much of the nation's business is done under the 25c bracket. At present there is no method of adjusting 8%, 12%, 17% or other fractional percentages in price rises among cigarette makers, bread makers, slot machine operators, newsstand and movic operators without resorting to enormously increased, highly cumbersome penny-method of change making. In addition, economists point out that one coin is easier to get for an item than two coins—a pertinent factor.

100% 200% 300%

A fifteen cent piece would help industries in general, and all small-coin business in particular. Such firms as cigarette makers, bread makers, ten cent stores and the like should have a coin like this to do adequate business.

The present nickel, dime and quarter coinage represents a 200% and 500% increase over the nickel in coin denominations. A 100, 200 and 300% coinage would stimulate trade in many lines besides the ten-cent-store and slot machine industries.

It is interesting to conjecture what the new articles brought into industry by such a coin would be like. At present the great variety of ten cent store items is limited in number by the nickel and the dime. A fifteen cent piece might under the prevailing scale of prices be responsible for serviceable cheap socks and articles of clothing not now carried by chain stores because of the too-great price spread.

100% 200% 500%

This will show you why the design of the present monetary denominations is all wrong. The smallest unit of money which can again be split into percentages to allow commissions, etc., is the nickel. The next coin is 200% increased in value. And the next coin is 500% increased in value. The spread is too great to care for gradual inflation, and the need for a 15c coin is quite obvious.

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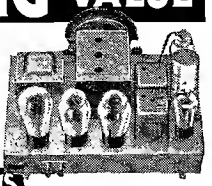

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"Heavy Duty" Underslung Trailer

(Continued from page 97)

Cross-rails of 1½"x4" hardwood are amply strong for most trailers, but if heavy live-stock are to be carried it is better to increase the size to 2"x4".

We will now take up the brake proposition. Figs. 4, 7 and 9 illustrate the theoretical working. Through a cock on the steering column, the vacuum created in the intake manifold when the motor is idling is communicated to two 3" cylinders. The pistons are literally "sucked" into the cylinders, and the brake bands are tightened by a rod leading to the brake arms. A 1/64" hole is drilled in each piston-head so that the vacuum is relieved when the cock is closed at the steering column.

Figs. 7 and 15 show how and where the cylinders are mounted on the trailer chassis. The cylinders can be made from a capped length of 3" pipe accurately machined inside. Any 3" pistons from an auto wrecking yard will serve. Of course, they must be fitted with good piston rings. If one can obtain a pair of discarded cylinders from a two-cycle type motor, these will serve without any remodeling. If the ports restrict the length of the piston stroke, they can be filled in with any iron cement.

Detail explanation of the guards over the tires and over the axle is not necessary. Instead of a metal housing over the axle, an inverted wooden trough can be used.

So much for the trailer chassis. A number of body designs and purposes to which this trailer can be put are shown in illustrations.

Improve Accuracy at Bait Casting

(Continued from page 80)

thumb on the reel to prevent the line from running out. Note that the rod is not brought back, over the shoulder, but only a little past the perpendicular in starting to cast. When the cast is finished, the rod will be slightly above the horizontal. Hence in casting the rod play is confined within a quarter of an imaginary circle.

If the reel is not an anti-backlash model, the spool will have to be thumbed to prevent it from revolving faster than the line runs out, resulting in a backlash. If the reel has an anti-backlash feature, turn the adjusting nut until the weight will slowly pull the line out.

In bringing the rod back for the start of the cast, the thumb must be held on the reel spool to prevent the weight from pulling the line out prematurely. In making the forward cast, the rod is whipped down to horizontal and during this motion the spool is released. It is difficult to tell the exact time to release the spool. That comes naturally after sighting at the target, and practicing a few times. If the spool is released too soon, the weight will likely over-shoot the target, or describe an unnecessary high arc, whereas if the thumb is held on too long the weight will probably strike the ground close to one's feet.

The next delicate timing is to replace the thumb on the reel, and increase the pressure

gradually in ratio to the decreasing momentum of the weight. In short, a brake must be applied to the reel spool to prevent it from continuing to revolve after the cast is finished.

In retrieving the weight (or lure, if fishing) the line must be re-wound fairly evenly on the spool. An unevenly wound line will cause backlash. With practice one may learn to guide the line with the left forefinger and thumb, holding the rod in the left hand at the same time and cranking the reel handle with the right thumb and forefinger.

Making Movies Beneath the Sea

(Continued from page 65)

And all I did was speak into a telephone, turn the switch that started the camera motor turning, and sit with my eye tight against the finder, hoping to keep the camera in focus.

Oddly, objects are magnified under the water and an actor not infrequently dodges fish that look to him as though they are about to snap at his nose. One morning we had a boy doubling for the star. He was supposed to gather up prop jewels and gold from a chest. Before he went down we had "pepped" him up a bit, telling him of the prevalence of sharks.

I had the camera rolling and he was ready to stoop down to the chest when two sea bass swam up expressing mild curiosity. The youth probably thought they were sharks, for they do resemble English bulldogs. Five times he backed around the chest, trying to beat them off when, in fact, neither was closer than three feet to his face. I literally was in spasms, though he, poor fellow, thought his life was threatened. The picture was a scream, though obviously it never reached a theatre.

I have seen many sharks, but never have seen one attack a man. In those rare cases where sharks attack humans, I'm sure the attack results from the flashing of the light flesh in the water. Nor will an octopus under ordinary circumstances rush to attack. I've filmed a dozen, some of them held in place by invisible wires; and every time an octopus is given his head, he makes off for parts unknown. Naturally actors are shy of the octopus, for they are formidable in appearance.

Some day I hope to get a good picture of an octopus shooting out his dark, protective liquid screen. To date, these thrilling episodes have taken place so close to my camera that the liquid obscures the entire scene. If an octopus would perform 30 feet from the bell, I'll guarantee to produce one of the most interesting shots ever to reach the screen.

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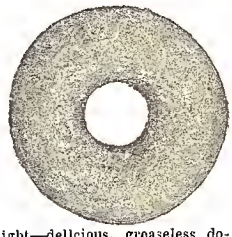

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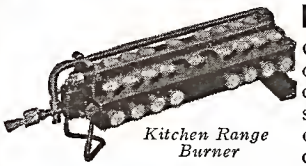

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Plans for a Midget Outboard Hydro

(Continued from page 101)

sides (no knots), $1.00; 1 piece fir ply-wood for bottom and rear decks, 8 ft. x 4 ft., $2.75; 4 pcs. pine, 3 ft. x 2 in. x ½ in. for ribs (buy 6 ft. lengths), $1.00, 1 piece white pine, 3 ft. x 8 in. x 3¼ in. for transom, $0.25; brass screws (small shanks) $1.00; Casein glue, $0.40; good grade oil paint and spar varnish, $2.00.

Cut the side pieces as per drawing leaving plenty of wood to spare. Plane this down to a perfect curve so that the bottom will fit smoothly. Screw the sides to the transom with long, thin screws about 1¼ in. No. 4. Bend around center rib and attach to nose block (2 in. x 4 in. x 24 in.) Put in the other ribs, cutting them to fit so that the boat will have a straight side from the center rib to the transom and a nice curve from the center to the nose.

Take care and plenty of time and do this well, measure often and correctly. Be careful that the boat does not warp during this operation. Next put the bottom piece on. Do not cut this out of the middle of the plywood as you will need this scrap for the deck. Do not cut too close to the sides when fitting to the frame as the edges can be planed down much better this way. Use plenty of glue as per directions on the package. Space screws on the bottom about two or three inches apart. These screws should be three-quarter inches No. 4 or 5. Fix a dashboard across the center rib and build the deck framework from this to the nose for a linen cover. A sheet will do unless something more fancy is wanted, but of course will cost more. The motor mount is a piece cut from an 8-inch plank and **bolted** to the transom. This will have to be adjusted to the type of motor used. It is best to put this on after the rest of the boat is finished. Chines can be put in and a keel piece also, which will make the boat stronger, but do not try this unless you are equal to the problems that will turn up.

Motors may have to be speeded up to make

(Continued on page 135)

Last Word in Houses—'Bungalette'

(Continued from page 122)

contour of the landscape. It can be built of lumber, brick or hollow tile. It can be placed on a 36-foot lot.

The home offers standard equipment, two bedrooms, living room, kitchen, bath, sun porch and large dining alcove all on one floor. While there are no upstairs sleeping accommodations, nevertheless the enclosed porch equipped with casement windows offer lounging quarters. Cost should range around $5000 and perhaps less if the house is built of lumber. In brick it will cost more.

Plan No. 4-W-65 is an English type four-room bungalow. An ideal place for a family of three or four people. A sun porch can be added if you wish more room. While there is no formal dining room the double window next to the fireplace will provide a pleasant place to set a table. The house can be built on a 45-ft. property. The cost should be around $3500 according to the designer.

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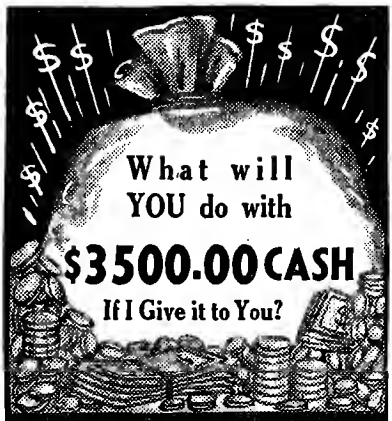

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Putting Design Theories to Acid Test

(Continued from page 85)

laboratories for over a year. The autogiro has been put through all sorts of tests and trials. Landings have been made with it when it did not roll forward as much as one foot after touching the ground. The most efficient size, shape and position for wing slots and flaps is a subject which has been carefully worked on for many months.

One very interesting study now being made at the laboratory pertains to the shape of the hulls and pontoons of seaplanes. Nearly every country has a different kind of a hull or pontoon for planes that land on the water. It would seem that manufacturers believe efficiency in this particular thing rests with the nationality of the designer. The technicians, however, believe that there is a definite shape for the most efficient hull and they mean to find out what it is from a purely scientific standpoint. Then when the tests show it to be the most efficient, manufacturers can use it. A two thousand foot water runway forms a part of the wind tunnel laboratory. An apparatus is built over this which runs like a street-car and a log or piece of wood shaped like a boat hull can be dragged along this waterway at about forty miles an hour while instruments record the amount of drag, suction and other forces acting on it.

One important thing learned in this particular research is that the forces which must be counted in the formulas for pontoons and hulls are about ten times as complicated as the regular wheel landing gears. The density of the water and the suction together with the spray are factors that are hard to tie in with wing lift at all stages of the "step off." It has already been found that the spray which ordinary hulls and pontoons kick up in front of a seaplane produces a marked retarding effect. Therefore, one problem is to find a hull that will not kick up so much spray. Hundreds of models must be dragged through the trough to find this out, unless luck favors the engineers.

When the most efficient seaplane hull is discovered there will be a rush to build speed boats on the same line and the design will spread to big steamships.

There is no direct profit derived from the work of the aeronautical laboratory. Science and the commercial world may profit by the research discoveries and the Government comes in for its share through these routes. The Government runs the laboratories and of course no direct profits can accrue to it, but when discoveries of military value are made, it may keep them for its own use. Anybody may have aeronautical equipment tested here—provided the committee believes it to be of sufficient value. But most of the work is done upon the initiative of the engineers themselves after approval of the chiefs. Most of the problems are those of pressing need in the field of aviation. An example of these is the formation of ice on airplanes and airships; "blind flying" instruments; how to get more power out of internal combustion engines; better motor fuels; etc.

An extremely interesting discovery has been

Putting Design Theories to Acid Test

made recently in the power output of gasoline motors. But "discovery" is scarcely the right word to use. It was the result of long, painstaking work in figures and tests. A method was worked out for clearing the exhaust gases from an engine cylinder and at the same time giving a slight boost to the intake pressure, and 18 per cent greater power was then obtained. In the words of the official report on this subject:

"The clearance volume can be efficiently scavenged by overlapping the timing of the inlet and exhaust valves and maintaining a slight boost pressure in the inlet manifold. The loss of fuel with the scavenging air can be avoided by replacing the carburetor with a fuel injection system and timing the injection of fuel into the engine cylinder. The result of tests conducted with a single cylinder test engine showed that power obtained when operating with valve overlap and a fuel injection system was 18 per cent greater than that obtained with normal valve timing and a carburetor. The specific fuel consumption for the two conditions was approximately the same."

It does not take a scientist to realize what an increase of 18 per cent means in an aviation engine or any other kind of engine. The technicians have only scraped the surface of this line of research. It is well known that a big percentage of the energy in the gasoline that explodes in a cylinder is dissipated in the form of heat and every bit of this energy which can be snatched back into useful work means mechanical progress.

So much energy is turned into useless heat when a gasoline motor runs that complicated cooling systems must be used, as everybody realizes. Most motors use water for cooling but air cooled motors for airplanes have been used for several years. Air cooled motors have thin fins extending out from the cylinders. The air is supposed to carry the heat of the cylinders away and keep them from melting in their own heat. This method of cooling cylinders had been generally thought to be pretty well settled.

But during the past few months, the N.A.C.A. technicians have given some study and experiment to the subject of fin cooling principles. And they have found that, quoting the report on the subject: " . . . about one half the cooling area of the cylinder does not come in contact with the cooling air because of the breakaway of the air stream from the cylinder."

This knowledge is of great importance at this time when airplane motors of tremendous horse power are being built with the fin cooling system. A formula on this may soon be issued.

In an attempt to remedy this defect in the fin cooling system a blower was devised which would force the air into all the corners where it broke away before and it was found that the cylinders could be cooled more uniformly and more efficiently by this method. This also opens up a new line of research.

Another very valuable phase of research which has occupied the attention of the technicians at the laboratory for a long time is airplane stabil-

(Continued on page 135)

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Portable Sail Rig Will Sail Rowboat

(Continued from page 119)

two twelve-foot sides. Use a nail to make the holes with, but break no threads of the canvas while making the holes. The holes are four inches apart, from one corner to the other, on both twelve-foot sides. Now place the spars, hinged together at one end, along the hemmed sides, and stretch the cloth out so there are no wrinkles. Through each hole in the canvas, run a foot of cotton fishline (the uncolored kind is best) so that six inches lies on each side of the canvas. Bring the ends under the canvas, and tie a square knot so that it comes under the hem, but not tight enough to wrinkle the hem. Pass the free ends of the fishline around the spar at the nearest point, and tie a second square knot. Do this with each of the holes all along the two twelve-foot sides. (See Fig. 1.)

For the mast, take a six-foot length of cypress, four inches square at one end, and three inches square at the other. Round edges and corners with a plane. Bore a three-quarters-inch hole two inches from the three-inch square end. Two inches below this first hole, toward the middle of the stick, bore a second hole, the same diameter. Remove the wood between the two holes with a chisel, so that it forms an oval slot. Knock the pin out of a small awning pulley, to get the wheel inside the frame. Select a drill the same size as the pin, and bore a hole through from the opposite side of the mast from the oval slot, in such a manner that the hole passes through the slot in the center of it. Put the wheel into the slot, and fasten it there with a bolt through the last hole bored. This forms a sheave at the top of the mast.

Taper the four-inch-square end of the stick, so that it will fit into a ten-inch plumber's nipple, three inches in diameter. The nipple should be threaded at the lower end. The lower end of the stick must fit very snugly into the nipple.

The bucketboard is made of a four-foot length of cypress, ten inches wide and two inches thick. This piece must be absolutely sound and free from all knots, since all the strain of the tackle comes directly upon it.

Find the center of one side, and bolt a plumber's floor plate, three inches in diameter over the center mark. Countersink the bolts on the lower side of the board, so the nuts are flush with the side of the board. (Fig. 2.)

The leeboard proper is made of a four-foot length of pine, free from blemish, ten inches wide and one inch thick. Feather the edges, as a canoe paddle is feathered, and round the upper end. In the middle of the arch formed by rounding the top of the board, bore a three-quarter-inch hole, and eighteen inches below this, near one edge, bore a second three-quarter-inch hole. The first hole is to receive the kingbolt, while the second is for the rope. The edges of the second hole therefore must be rounded with a taper file.

The kingbolt is five inches long, and ¾ inches in diameter. It passes first through the hole in the top of the leeboard. Then slip on a washer, large enough to cover entirely a roller skate wheel's diameter. Then slip on a roller skate

Portable Sail Rig Will Sail Rowboat

wheel of the ball-bearing type, and a second washer, just large enough to cover the inner rim on the wheel, follows.

Drill a ¾-inch hole through a six-inch square block, two inches thick. One side must be countersunk to take the nut from the kingbolt. Slip the block over the kingbolt with the squared hole away from the last washer, and put on the nut. Tighten moderately. Saw away the remaining length of bolt.

Bore a one-fourth-inch hole in each corner of the block. Bolt the block to a two-foot length of sound board, an inch thick and ten inches wide, by passing stove bolts through the block. This, if properly done, will conceal the nut end of the kingbolt entirely. (Fig. 3.)

The steering block is easy. Merely an eight-inch length of two-inch thick cypress or pine, six inches wide. Bore a hole in one edge large enough to take an oarlock cup. Put the oarlock cup in place, and wedge.

Now you are ready to get ready for a sail. You will need two lengths of clothesline (the woven kind is best). One length is eight or ten feet long, and the other is fifteen feet long. You will need about four feet of sashboard, too.

Six "C" clamps complete the tackle. A word of caution, in buying the "C" clamps. Get drop

(Continued on page 136)

Cruise Under Water in One-man Sub

(Continued from page 107)

stream-line portions of the superstructure. If this is not sufficient, molten lead may be poured into the cones, and weights may be welded onto the lower portion of the bow cone and the lower stabilizing fins at the stern.

From the tow ring a rope at least 100 feet long should be run to the towing craft, and the deeper one intends to descend, the longer should be this rope in order that the pull shall be as nearly horizontal as possible.

Care should be taken not to submerge too suddenly. From a surface speed of 30 miles, the craft will check to about 15 when submerged, and the shock of this transition should be spread over as much time as possible.

The air inside the boat will be sufficient for approximately half an hour's stay under water. For safety's sake it is well to have an oxygen tank as part of the equipment, and this can be attached just inside the bow cone within easy reach of the operator.

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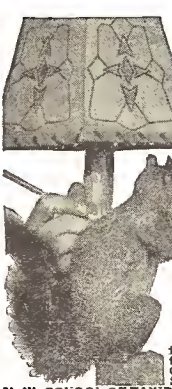

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Fortunes Waiting for Inventors

(Continued from page 87)

States alone about 100,000,000 electrical outlets. These outlets require that the prongs of the electrical plugs used in connection with them be inserted in a certain critical position. What is really needed is an outlet that will receive a plug at any angle. Thus in place of the openings in the outlet being confined to small slots there should be but a single opening and this should be in the form of a continuous circle. Such an improved article designed right and able to pass the Fire Underwriter's tests would be worth at least $100,000 cold cash.

Several hundred million toothbrushes are used in the U. S. A. every year. To the inventor who will invent some sort of a simple substitute for the toothbrush that will screw directly onto the end of a tube of toothpaste and through which the toothpaste will feed automatically when the tube is pressed there will be a fortune that will make Gilette's fortune from the safety razor look like small change. The thing should be very cheap and does not have to be made of bristles if a good substitute can be found. Get busy you inventors. Here is something big to shoot at!

Those who like to work on problems with a little more complication will do well to devote their attention to a simple method or device that will eliminate the foreign matter that accumulates in the bottom of the gas tanks on automobiles. While we have gas filters, they also have to be cleaned out occasionally. What is needed is a device built right into the bottom of the gas tank into which this foreign matter will accumulate and through which it may be removed very easily.

Not only would this eliminate the gas filter but it would also eliminate plugged gas lines which the gas filter does not prevent. That trick will be left for the independent inventor. There is a large fortune waiting for a successful device.

Some years ago a man made himself a great fortune with the "Mama" doll; that is the doll that would say this word when it was tipped backwards. There is a similar fortune waiting for the man who can supply some sort of a device that can be attached to a boy's velocipede and that will make it sound like a real automobile.

There should be the sound of a smooth, even running motor and, naturally, the device should be geared or belted to the rear axle of the car or cart, the sound being available only when the device was actually moving.

Those who understand optics and projection will be interested to know that an auto stop light could be used that, in place of merely flashing red or green, would actually throw the word "S T O P" on the pavement at night. It would flash red also.

In other words in place of having just an ordinary stop light the autoist would have what would amount to a small but powerful magic lantern on his car and this would flash the warning signal on the pavement at night. While the device would work during the day time it would not be seen. However, this would not by any means defeat the invention for the simple reason that most rear-end collisions happen at night.

Putting Design Theories to Acid Test

(Continued from page 131)

ity. The mechanics of airplane stability were worked out many years ago, but strange as it seems, it has been applied to airplane design in a very limited manner. This is due to the great complexity of the flight formulas. The cut and try method is still the basis of most airplane design and manufacture. General principles are adhered to but only in a general way. This is why airplanes have been built on the same broad lines for so many years and it has led to the "conventional" airplane.

Not one single airplane of new design has ever been built, probably, which has not undergone many changes **after** it was flight tested. And this refers to the "conventional" type, not just the freaks. This is because nobody has taken the patience to figure out ahead of time just what a new type airplane will do when it gets into the air. The mathematics of the problem is so involved that it is really easier to build a plane along generally approved lines and make the corrections on the real product after test flights. The designers and manufacturers today know whether their new model plane will fly because they cut close to the pattern of planes that have already been flown, but they do not know whether it will be tail or nose heavy, how it will react to the controls, whether it will "hunt" in the air, i. e. jump like a live baseball, or whether it will come out of a tail spin. The technicians of the N.A.C.A. intend to simplify the mathematics of the problem for everybody to use.

In the words of a recent statement from the committee:

"A study of the entire stability problem is now being made at the committee's laboratory for the purpose of preparing the data in easily usable form so that a designer may readily compute in advance both the longitudinal and lateral stability characteristics to be expected in his airplane."

Thus flying is being reduced by the experts of the National Advisory Committee for Aeronautics to simple figures. And it is being reduced to figures in order that the process may be completely reversed—that the figures may be fitted to the wings.

Plans for a Midget Outboard Hydro

(Continued from page 128)

this job plane and the best way to do this is to put them in the best running condition possible. Take out the inner core of the muffler and punch larger holes in the outer case. Cut the throat of the carburetor larger and smooth with fine sandpaper. Raise the spray jet in the throat as high as possible and enlarge the holes in the jet. If you wish to take the chance, though I don't advise it, trim a little off the blades of the **regular** propeller. After mounting the motor see that the cavitation plate is about one-half inch below the bottom of the boat, or rather see that the propeller is barely in the water when planing. This will take quite a bit of experimenting to get the proper result.

Figure out all the little things that stump you by yourself and remember that I built this alone with no plans, so surely you can do just as well.

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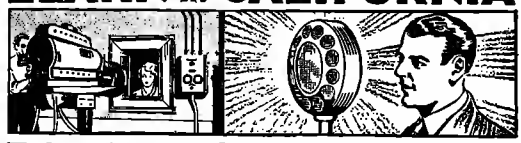

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Portable Sail Rig Will Sail Rowboat

(Continued from page 42)

forged steel-jawed clamps, with a six-inch jaw. Cheaper kinds can be bought, but they may break, and a break is both costly and dangerous.

Now go hire a boat. Get a boat with three seats in it, counting the stern seat. That's the only thing you need to be fussy about, excepting that you ought to ask if the boat leaks.

Place the bucketboard from one seat to the other, in the middle of the boat, parallel with the keel, and directly above it. The floor plate wants to be upwards. Into it, thread the nipple on the foot of the mast. The sheave should be running the same way as the keel, and you run the short length of clothesline through the sheave. Tie the stern end of the line to a point on the uppermost spar in a slip knot. The point on the spar must be determined by experience, since no two outfits balance alike. When once determined, it is a good idea to paint a black band around the spar at that point.

Be sure your boat is headed right into the wind at the wharf. Now pull up the sail, so the lower spar clears the sides of the boat by ten or twelve inches. At the point on the mast where the lower spar touches, take two wraps around the mast with the four-foot length of sashcord. Tie it firmly with a square knot first, leaving both ends of equal length. Now tie about a half dozen or ten half hitches in the free ends. Then tie the remaining ends firmly to the lower spar. This forms what is known as a "jaw." It permits the sail to "swivel" easily on the mast, but the sail can't get away from the mast at that point.

Tie the long length of clothesline to the rear tip of the lower spar, using two wraps and a couple of half hitches, or a slip knot. Some prefer the slip knot, because there is less danger of the line coming loose.

About half-way back on your lower spar, hang the leeboard over the side of the boat, and clamp it firmly in place, with the sideboard on the outside of the boat. It makes little difference which side of the boat it is placed. Run a short line from the hole that is lowest on the leeboard, back to the stern seat of the boat, but do not tie it.

Clamp the steering block in the middle of the stern of the boat, with the oarlock cup up, and put an oar into the cup. (Fig. 5.)

Untie the bow of the boat first. Now seat yourself on the stern seat. Take the line from the rear end of the lower spar in one hand, and cast off the stern rope to the wharf. You're moving. Grab that oar, behind you, and miss that green rowboat that's coming in, with the fat lady in it. No matter whether you've ever sailed or not, after fifteen minutes in this boat, rigged with the portable sailing rig, you'll be a sailor.

When you get back to the boat livery, sunburned until your eyebrows are white, simply unclamp the six clamps, furl the sail around spars and mast. Toss the bucketboard, leeboard tackle and steering block into the rumble seat, tie the sail and spars on the running board, and pay the boatman.

Dempsey on Mechanics of Boxing

(Continued from page 42)

delivering a blow. The principle of the lever is one of the prime fundamentals of boxing. If you understand this point you can understand how a strong right or left arm can transmit or modify force and motion. You've got to look at the human body as an engine. In reality, it is an engine of many parts.

"That big mechanism is possessed with energy, potential and kinetic power. It has one enormous factor that other mechanical instruments do not possess, and that is brain power. Take an automobile or an airplane, start the engine going and let that vehicle proceed without human guidance and you are bound to see that machine strike ruin and disaster. Proper guidance, then, is a part of the fighter's scheme of beef-and-brawn. There can be no shirking in upkeep and maintenance where the fighter's body-engine is concerned.

"Take the left hook, by far my favorite punch. Its source of strength is in the left shoulder. It's short and fast and murderous.

"There's perfect co-ordination in that left hook. The fist and elbow turn quickly and drive for only about six inches. The propulsion which the hook gets from the shoulder as the body swings with it gives the impact its effectiveness. You learn time precision by practice—then it becomes a matter of instinct.

"The jab and the right cross are worked on the leverage system. The same might be said for the uppercut. The body proper acts as the solid foundation and the shooting arm, backed by that firm structure working as an axis, gives the fist the force for most damage. The punch must be straight out with the body behind it and not by pulling the arm back and then shooting out. This is not only a waste of energy, but also useless and warning the other fellow of the blow.

"Footwork is a vital part of the boxing profession. Here again you encounter science and mechanics principles. Any architect will tell you that big buildings sway a little in windstorms. If they didn't, and were stiff and unyielding, they would not be able to withstand the powerful gales and would be smashed down. The same applies to the fighter. He must not pose stiffly. He must relax, possess agility. Bobbing and weaving, ducking and dodging are all a part of the expert boxer's tricks.

"The successful boxer must have stamina and this is attained through rigid scientific training methods. Road work, work-outs in gyms, sparring and shadow-boxing, strict diet, regular hours, capable handlers and trainers, all these are part of the ambitious fighter's repertoire. The fight game calls for strong character and good habits. You can't get to the top without these essential qualifications.

"As a promoter, I and my associates are always going to keep an eye out for worthy timber. There's no telling from what part of the country the next big drawing-card is apt to spring. I've been through the whole rigmarole, and I don't think I've missed many of the rigors and trials of the business. I'm going to give any strong championship candidate I pick out a fair chance. I want to encourage potential champs.

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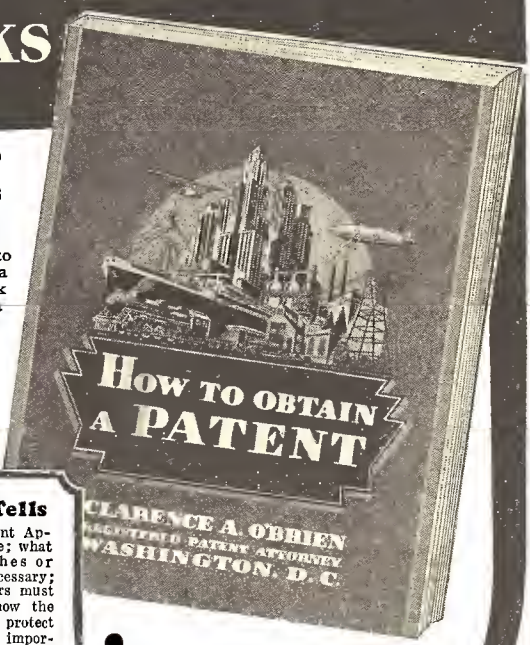

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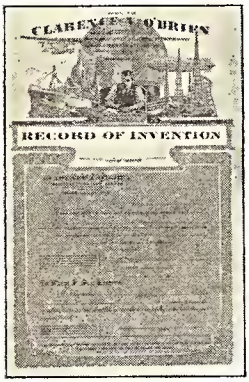

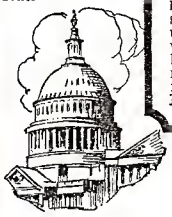

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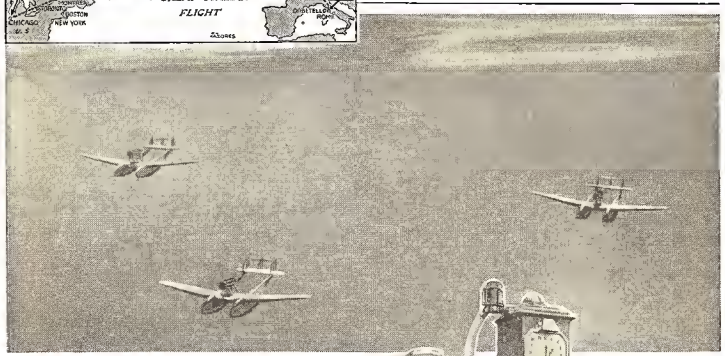
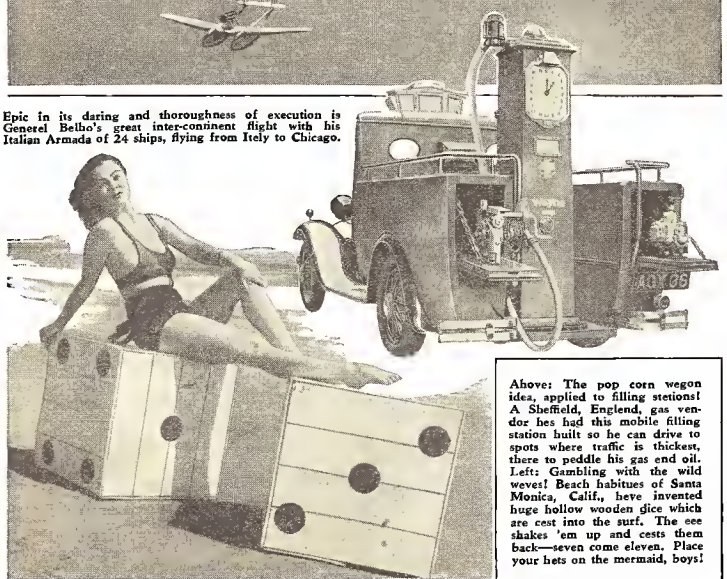


Epic in its daring and thoroughness of execution is General Balbo's great inter-continent flight with his Italian Armada of 24 ships, flying from Italy to Chicago.

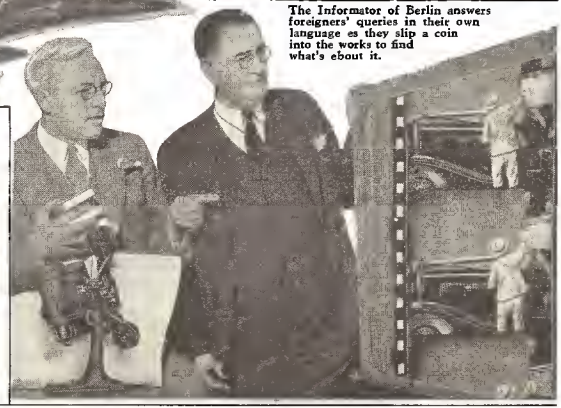


Above: The pop corn wagon idea, applied to filling stations! A Sheffield, England, gas vendor has had this mobile filling station built so he can drive to spots where traffic is thickest, there to peddle his gas and oil. Left: Gambling with the wild waves! Beach habitues of Santa Monica, Calif., have invented huge hollow wooden dice which are cast into the surf. The sea shakes 'em up and casts them back—seven come eleven. Place your bets on the mermaid, boys!

NEWS of the Month

that capture the public fancy.

The Informator of Berlin answers foreigners' queries in their own language as they slip a coin into the works to find what's about it.



Above: A "wellen-tumbler," as the Germans call it, will teach you how to swim like a motorboat. Just strap it around your neck, wind her up and let the machinery do your swimming! What ho for the life of a sailor! Right: A clever San Francisco attorney, Joe Garry, uses movies of an injured man petitioning for insurance damages to show the claimant doing a good job of polishing a car while allegedly laid up.

LOS ANGELES RACES *Prove* AIR THRILLERS

by JAMES BOWLES

More and more power and less refinement of streamline design is the cry of present day designers as proved by contesting planes in great 1933 Los Angeles Air Races. Flown across country by an eye witness this up-to-the-minute account of the past year's aviation progress summarizes records, achievements and points out the races' thrills.

Gordon Israal, 22-year-old pilot from St. Louis, and his spatial Manasco 6 of 180 h.p. With less than 20 foot soan this ship can dn 200 miles easily.

Liaut. Tito Falconi, youthful Italian ace, who did barrel rolls right off the ground!

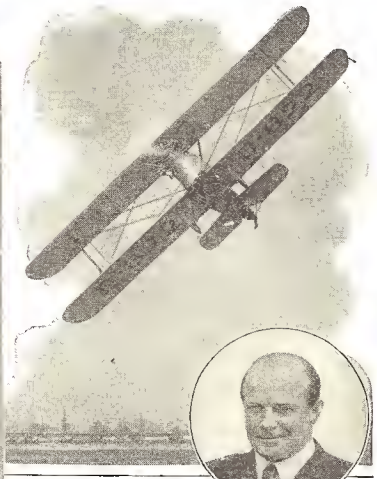
Hollywood stunt pilots paint thair flaming way with smoka trails as they cut capers around one of tha pylons. In one of these dashes, Hoot Gibson, cinama actor, was hurt.

ROARING across the continent in 11 hours, 30 minutes, Col. Roscoe Turner not only clipped 63 minutes from his former east-west trans-continental speed record, but he inaugurated something new in the way of planning his route.

The speedy Wedell-Williams low-wing monoplane which Col. Turner piloted has flown in excess of 300 miles an hour, although his average speed across the continent was a little less than 250 miles an hour. At that velocity, he cannot afford to fly through rain storms.

Avoids Rain by Phoning

Accordingly, the night before he took off from New York, he telephoned to Los Angeles, where California Institute of Technology scientists recently announced a new system of weather forecasting so accurate they can predict where storms will gather anywhere in the United States. At two points along the route, Turner was told, he would encounter showers.



Immediataly abova and at right. A famous pair! Ernst Udat, of war fama and present day air show acclaim, and his 7 year old Fokker biplane which had the whole grandstand agog day aftar day by picking up handkerchiefs with a hook on his wing tip, not to mantion looping off the ground and upsida down flight tan faet off the tarra firma. Udat surpassed aven our own Johnny Millar who cut capers such as loop-tha-loop and barral-rolling an auto-gyro.

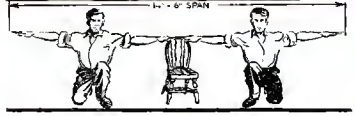
Blasting his way 2300 miles in 11 hrs. 30 mins., Col. Roscoe Turner in his Wedell-Williams racer (right) sat a new trans-continental racord.

Although he was instructed to turn slightly south from his course between two of his stopping points, Col. Turner added the extra miles for safety and slid down to a three-point landing early in the afternoon, a half hour ahead of his nearest competitor, Jimmie Wedell.

Increases in Power

This year's races saw more power pouring from the already powerful engines used in the tiny racers. Last year Maj. Jimmie Doolittle won the Thompson 100-mile dash with a 750-horsepower engine pulling his monoplane through the air at Clevcland. This ycar, Col. Turner won the same epic event with the engine "souped up" to nearly 1,000 horsepower!

Dasarving Col. Roscoa Turnar (California Narl. Guard) in blua tuoic and braid cap racaivas tha plaudits of the throng upon bis dramatic aftarnoon landing in Los Angalas.



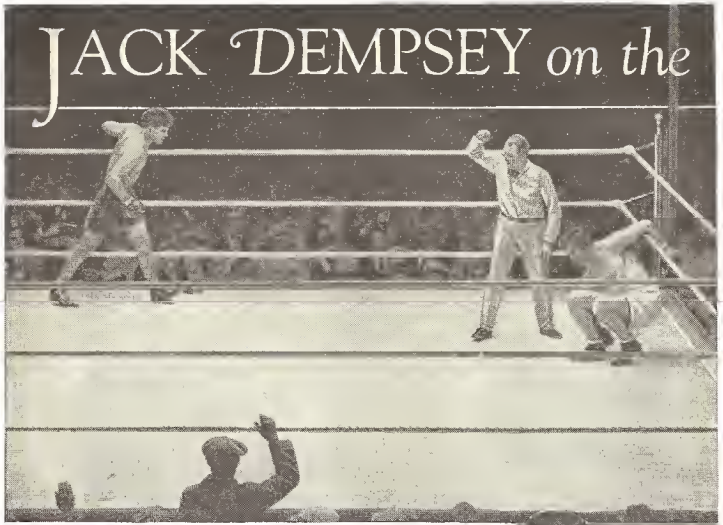
Tha "Clipper"—375 cubic inch class racar by S. J. Wittman, of Oshkosb, Wis., has a wing span of but 14 ft. 6 in.

Many of the midget planas wara hoodad for greater comfort for tha pilot. All starts ware racahorsa starts, tha groundman holding tha ship until the motor was ready.

True, Col. Turner did not reach the speed attained by Doolittle, for fairly heavy crosswinds impeded the racers at Los Angeles. But the increased power indicates the trend in racing. More power instead of more streamlining. The blunt-nosed fuselage has

JACK DEMPSEY on the MECHANICS of Boxing

The Manassa Mauler, now turned promoter, here tells Ben Lincoln some of the essential mechanics to be closely watched in the development of a real champion, adding illustrative excerpts from his colorful experiences.



The wounded Tunney crouches for the famous long count at Chicago, one of the two most dramatic moments in ring history. Down for fourteen seconds total time, Tunney retreated before the infuriated Dempsey, shown pacing out of a neutral corner, and won the Championship by running backwards the rest of the fight while an all-time record gate of $2,658,000 looked on. Judges allowed the fight to Tunney on his generalship. It marked one of the high points in Jack Dempsey's career as a blasting fighter and public idol.

JACK DEMPSEY, most colorful fighter the prize ring has ever seen, said to me the other day, "You can count on me to restore the $1,000,000 purse to the boxing world."

Ring science and mechanics have undergone amazing changes since the Manassa Mauler first started the climb to fame and fortune on the brakebeams of prairie freights nearly two decades ago, culminating in the million-dollar bonanzas which made him the best drawing-card of pugilism.

Today the still dynamic Jack Dempsey finds himself transformed from a million-dollar box-office attraction to a million-dollar promoter. He has hung up his gloves, he told me, and is devoting his talents to the emulation of the great Tex Rickard.

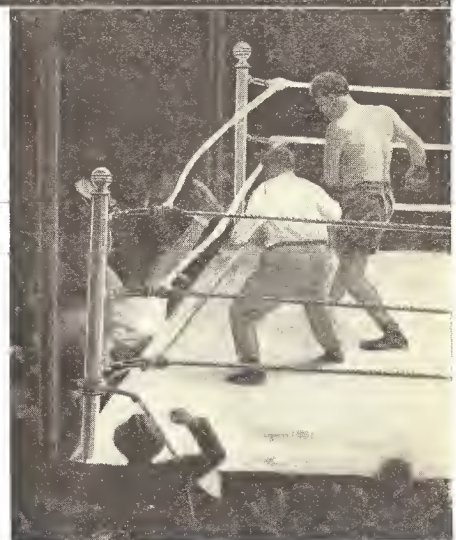
"You can't have million-dollar purses, of course," Dempsey said to me, "unless you've got fighters worth that coin." He was sitting at his desk in the offices of the Jack Dempsey Sporting Club, 1650 Broadway, New York City, where he is head man as the Manassa Promoter, as his cronies now call him.

"It's caliber that makes the million-dollar purse," the ex-warrior continued, "and the pugilist who can command that figure in this depression era has got to have what it takes. He's got to be the sum total, physically and scientifically, of all the boxers of olden days, of the gold standard age.

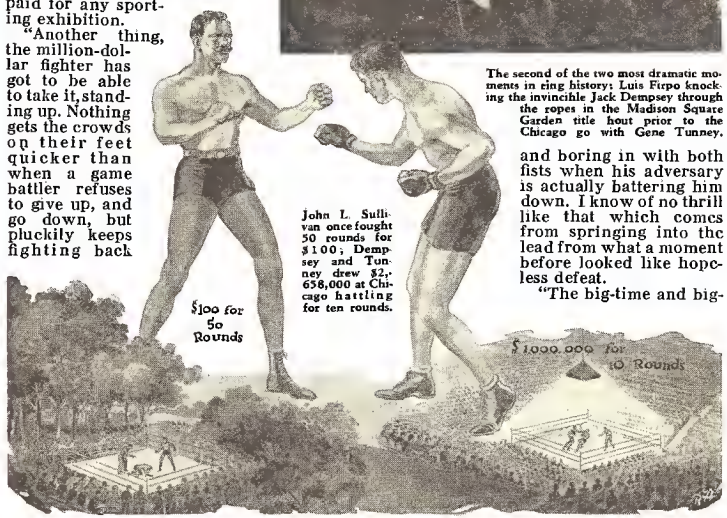
Jack Dempsey illustrates the famous Dempsey crouch, a method of "leading" which was a good offense because of its elusive defensive characteristics, making him hard to hit and placing him in near-position to shoot with either hand from any point. The right is drawn as for an uppercut, no "telegraphing."

"First and foremost, he's got to be a fighter. A real, ferocious fighter at heart. The so-called fussin'-around type does not go. They used to call me the Tiger, well, that's what he's got to be like. Action, that's what the customers crave. I gave them all the action I was capable of, down to the last gasping breath. It was that courage and the desire to give everything I had that made me the recipient of the first million-dollar purse ever paid to a boxer, the highest price ever paid for any sporting exhibition.

"Another thing, the million-dollar fighter has got to be able to take it, standing up. Nothing gets the crowds on their feet quicker than when a game battler refuses to give up, and go down, but pluckily keeps fighting back and boring in with both fists when his adversary is actually battering him down. I know of no thrill like that which comes from springing into the lead from what a moment before looked like hopeless defeat.



The second of the two most dramatic moments in ring history: Luis Firpo knocking the invincible Jack Dempsey through the ropes in the Madison Square Garden title bout prior to the Chicago go with Gene Tunney.



John L. Sullivan once fought 50 rounds for $100; Dempsey and Tunney drew $2,658,000 at Chicago battling for ten rounds.

"The big-time and big-

World's Deadliest Weapons Will WAGE NEXT WAR

INFRA-RED RAYS NORMALLY EMITTED FROM SHIP ATTRACT TORPEDO
PHOTO-ELECTRIC CELL SENSITIVE TO INFRA-RED RAYS
CONTROL ROD TO STEERING MECHANISM
BALLAST TANK

Mechanism of the new "dead-shot" torpedo, which always gets its ship, is seen here. When infra-red rays emitted by vessel impinge on the photo-electric cell, the current set up shifts the steering mechanism towards the source of the rays. It's thus impossible for the ship to dodge.

While peace parleys convene, only to end in failure and increased hatreds, military inventors smile to themselves and go on perfecting their engines of death. This article sets forth advanced data on these new weapons and tells how they will add deadliness to combat when they appear at the Front in next war.

by RUSSELL J. MORT

FROM the bow of a submarine lurking submerged in the offing shoots a torpedo bound on a mission of destruction. Leaving a streaked wake as it cleaves the water, it speeds straight for the hull of an unwary destroyer cruising across the horizon.

In the crow's nest of the destroyer, the lookout scanning the sea's surface for any sign of an enemy, picks up the white foaming line whose point is tearing towards his vessel. Without a moment's hesitation he shouts the ominous warning into the speaking tube leading to the bridge: "Torpedo off the starboard beam!"

Hard A'port to Avoid Torpedo

With cool haste the destroyer's commander signals the helmsman to put the wheel hard a'port. Then while the long, deadly torpedo dashes ahead, the lean, gray destroyer swings sharply to the left, and the commander breathes a sigh of relief, for he believes he has maneuvered around in time to get out of the path of the onrushing missile.

But suddenly and unaccountably the torpedo alters its course, too, and makes a bee-line straight for the destroyer's hull. The ship's commander is bewildered at these strange antics. Again he signals hard a'port. The vessel swings around again, and again the torpedo, now only a hundred yards off, changes its course—straight toward the war dog's hull.

No Escape

The commander shouts orders for the third swing to port, but it's too late. The torpedo dashes against the destroyer's side and there is an ear-splitting detonation. Like some inescapable undersea Nemesis, the submarine's missile has hunted down its victim and sent it to the bottom of the sea.

Thus may naval encounters of the future result, thanks to the development of a new type of torpedo which will literally chase its victim around the ocean till it finds its mark.

Complete details of the amazing torpedo are veiled in secrecy. However, sufficient information has been released by its inventors to give a fairly clear idea as to the operation of its mechanical steering brain.

Infra-red Rays Steer Torpedo

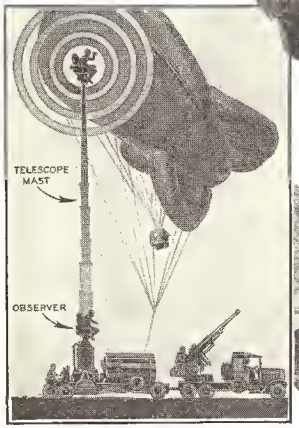
The secret of the steering mechanism lies in the electric eye built into the nose, just beside the detonating cap, as illustrated in an accompanying drawing. Special filters mounted in front of the "eye" screen out all but infra-red rays, that is, the invisible heat rays at the lower end of the light spectrum.

When infra-red rays impinge upon the electric eye, a current passes through it which operates a set of relays controlling the steering mechanism of the torpedo, shifting the rudder to direct the missile in the direction from which the infra-red rays emanate.

Now most all bodies which radiate heat radiate infra-red rays, heat and infra-red rays being practically the same thing. A naval vessel radiates a slight degree of heat from its engines and it is these infra-red rays which attract the torpedo to the vessel's hull, much as a magnet attracts a piece of steel. No matter what maneuvers the ship may go through, the torpedo, speeding towards the source of the infra-red rays, will always strike its target.

One of a number of new instruments of war, the invention of this new engine of death points out a distinct trend in the development of weapons for future wars. There is much wild talk among laymen in military matters about weapons so hideous that in battles in the next war whole regiments will be annihilated in the batting of an eye.

Thorough research on the part of MODERN MECHANIX AND INVENTIONS correspondents, however, indicates that military in-



The new telescoping tower which will replace the cumbersome captive balloon in the next war. The last word in mobility, the tower can be transported with ease of a truck, and run up at any point where observations must be made of enemy movements and artillery fire. Tower rises 200 feet at push of button.

FLYING *with* PICCARD *in the* STRATOSPHERE

Behind the newspaper headlines relating the progress of Prof. Piccard's stratosphere flight lies this fascinating story of the scientific details of the amazing aeronautical adventure.

WHEN the Piccards take to the stratosphere in search of new data on the behavior of the mysterious cosmic rays emanating from interstellar space, the pulse of the whole civilized world beats a little faster. The imaginations of millions of people are aroused to new heights by the thought of a pair of scientific adventurers penetrating the icy reaches of outer space, there to wrest from the universe a few more of its stubborn secrets.

To the awe-stricken public following in the newspapers the trail of the stratosphere navigators, the flight is an amazing adventure into the heavens. Behind the scenes, however, lies another adventure which will elicit the keenest interest for MODERN MECHANIX AND INVENTIONS readers.

The extensive preparations made for the flight, the intricate calculations involved in floating the great gas bag up into space, the unusual construction of the stratosphere gondola, and the way the intrepid space navigators live during their journey through the void—all these details make a fascinating story within a story.

Filling the huge balloon in preparation for the ascent is a spectacle. Into an appendix-like arrangement at the bottom of the bag—a small tube several feet in diameter—is fed 125,000 cubic feet of hydrogen 99½ per cent pure. At first lying flat on the ground like an unboisted circus tent, the giant envelope begins to rise in the middle like a bubble, then, as gas is fed in, it assumes the shape of a fantastic mushroom growing at a startling rate in the cool of the evening of the ascension.

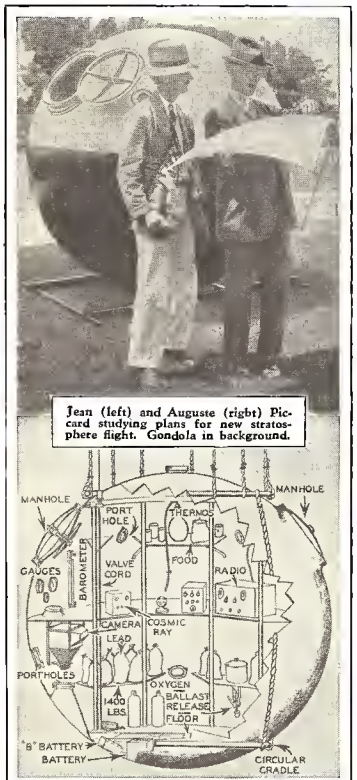
When completely inflated for the take-off, balloon is an elongated, flabby, billowing bag only 25 per cent filled with hydrogen. This strange sight, which makes unscientific onlookers wonder how such a thing could ever get off the ground, is due to the necessity for expansion as the balloon rises into the rarified atmosphere, where, at 11 miles altitude, it attains complete distension.

While the ground crew hangs onto the array of ropes depending from the envelope, the stratosphere fliers climb into the cabin through the two manholes on the sides. The globe-shaped cabin is seven feet in diameter and rests in a ring-shaped cradle.

In deference to scientific laws, the top of the cabin is painted white, the bottom black. At extreme altitudes the gondola's white top will reflect the intense rays of the sun, and thus avoid overheating of the occupants. The black portion absorbs sufficient heat from the earth to keep the fliers comfortably warm when the temperatures are dropping to 75 below zero.

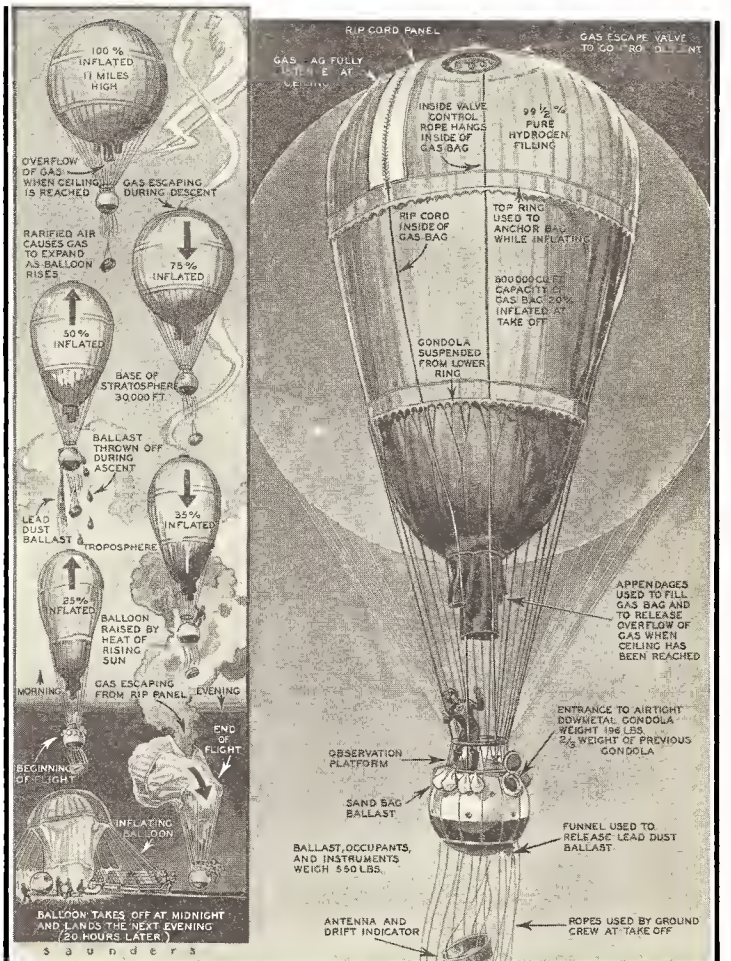
Leakage of air from the sealed gondola at 10 or 11 miles above the earth would be fatal to the scientists, so care has been taken

(Continued on page 19)



Jean (left) and Auguste (right) Piccard studying plans for new stratosphere flight. Gondola in background.

Sketch of the interior of the latest Piccard stratosphere gondola shows arrangement of the various instruments. Fliers ride on "roof-garden" on top of cabin when near earth.


100% INFLATED 11 MILES HIGH
OVERFLOW OF GAS WHEN CEILING IS REACHED
GAS ESCAPING DURING DESCENT
RARIFIED AIR CAUSES GAS TO EXPAND AS BALLOON RISES
75% INFLATED
50% INFLATED
BASE OF STRATOSPHERE 30,000 FT.
BALLAST THROWN OFF DURING ASCENT
LEAD DUST BALLAST
35% INFLATED
TROPOSPHERE
25% INFLATED
BALLOON RAISED BY HEAT OF RISING SUN
MORNING
GAS ESCAPING FROM RIP PANEL
EVENING
END OF FLIGHT
BEGINNING OF FLIGHT
INFLATING BALLOON
BALLOON TAKES OFF AT MIDNIGHT AND LANDS THE NEXT EVENING (20 HOURS LATER)
saunders
RIP CORD PANEL
GAS ESCAPE VALVE TO CONTROL DESCENT
INSIDE VALVE CONTROL ROPE HANGS INSIDE OF GAS BAG
99½% PURE HYDROGEN FILLING
RIP CORD INSIDE OF GAS BAG
TOP RING USED TO ANCHOR BAG WHILE INFLATING
800,000 CU. FT. CAPACITY GAS BAG 20% INFLATED AT TAKE OFF
GONDOLA SUSPENDED FROM LOWER RING
APPENDAGES USED TO FILL GAS BAG AND TO RELEASE OVERFLOW OF GAS WHEN CEILING HAS BEEN REACHED
ENTRANCE TO AIRTIGHT DOWMETAL GONDOLA WEIGHT 196 LBS. ⅔ WEIGHT OF PREVIOUS GONDOLA
OBSERVATION PLATFORM
SAND BAG BALLAST
FUNNEL USED TO RELEASE LEAD DUST BALLAST
BALLAST, OCCUPANTS, AND INSTRUMENTS WEIGH 550 LBS.
ANTENNA AND DRIFT INDICATOR
ROPES USED BY GROUND CREW AT TAKE OFF

Flight schedule is illustrated in the panel at the left above. Climb into sky begins at 11 p. m. to permit gradual, controlled ascent. Maximum altitude is reached at about 3 p. m. in afternoon of following day. Ballast is dumped to ascend, gas is valved to descend. Details of the stratosphere balloon construction are seen at right. Large circle shows size of envelope at 11 miles altitude, where intense sun's rays and rarified atmosphere cause gas to expand to four times earth volume. Fliers ride on the "roof garden" till they reach about 15,000 feet in early morning.

How I Face Death to Tame Jungle Cats

by CLYDE BEATTY
Famous Animal Trainer

Unusually vicious animals are held in leash while learning elementary tricks by chain and rope as illustrated. Attendants outside pull tiger pupil away when he tries to attack the trainer.

Clyde Beatty entering the "Big Cage" for a bout with the vicious "Jungle Cats," armed with the three really harmless weapons he uses to control his charges—a whip, an ordinary chair, and a revolver which is loaded with half a dozen blank cartridges. Reports of the blanks intimidate the enraged beasts.

Death lurks in every motion of the jungle cats going through their paces at the circus under the unflinching eyes of Clyde Beatty, famous animal trainer. In this fascinating behind-the-scenes view, the author of "The Big Cage"* tells how mechanical tricks aid in quelling violent lion-tiger battles and in developing savage jungle beasts into brilliant actors.

CIRCUS-GOERS who sit breathlessly watching me put my jungle cats through their paces in the big cage, and expecting a howling bedlam to break loose at any moment, are seldom aware that their expectations are much closer to realization than they would like to believe!

Behind the seemingly orderly procedure of my animal acts in the big cage there seethes the pent-up fury of vicious jungle beasts who not only hate their human master, but also their fellow performers, and sometimes, I think, even themselves.

A violent storm of animal vengeance always impends, and when it breaks all the resources of human will power and scientific ingenuity are required to bring peace and quiet again.

An experience that comes close to being the greatest thrill of my life took place when we were playing at Collinsville, Pennsylvania. This dramatic happening has since become known around our show as the Battle of Collinsville.

My animals had behaved well for five consecutive performances, and I was anticipating no trouble—that is, nothing out of the ordinary—when we reached this Pennsylvania town. All went well during the afternoon performance, but the evening performance saw my act pretty nearly wrecked.

It was then my regular practice, in getting things under way, to start by letting three tigers into the arena. They were trained to take the three high pedestals.

Then I sent the lions in—twenty males and females—holding back the rest of the tigers until their enemies were seated.

My lions always mill around on the floor until I make my entrance. There is a throng of lions about the safety-cage where I stand, armed with chair, gun and whip, ready to fight my way into the arena.

As I stood peering out of the safety-cage that day in Collinsville, one of the lions leaped high up without warning and dragged Rosie, "the roll-over tiger," down from her lofty seat.

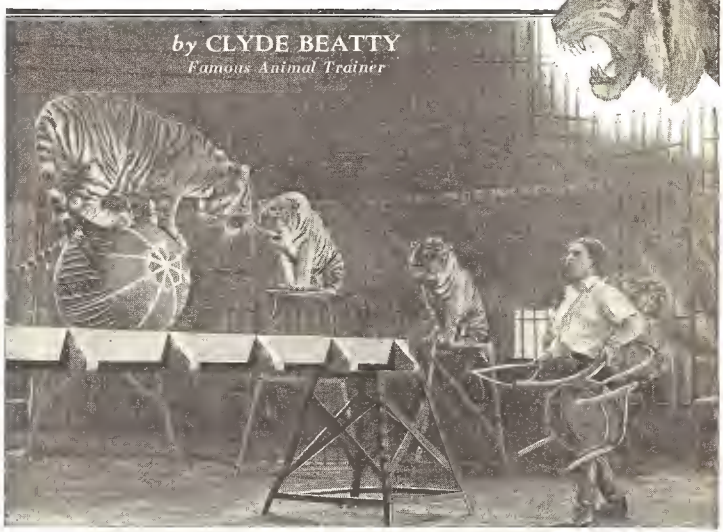
As Rosie landed on the floor, lions started after her, but she fought herself free before any one of them could secure a real hold, and scrambled back to her perch. She was just getting seated as I made my entrance. Cracking my whip and blazing away with my gun, I quickly got the lions up on their pedestals. Then I let in the rest of the tigers and seated them.

When this is done, and all my cats are ranged around the arena, I have formed the living pyramid that features the first part of my act.

I had hardly pyramided the group when Snip, a tigress, jumped off her pedestal and ran under the pedestal occupied by a scrappy lioness. Infuriated, the she-lion jumped down on top of "Snip." Then, almost instantly, Duke, the big lion that had started the fight with Rosie a few minutes earlier, jumped down off his pedestal and grabbed a tiger.

All the other tigers except three jumped to the floor of the arena—not so much to join the fight as to be in readiness to leave the arena. There are no greater scrappers than tigers, but they avoid fights, whereas the lion instinctively starts a fight. The tigers had hardly touched the floor of the arena when the lions, every single one in the act, were after them. Each lion was making a lunge for the nearest tiger.

The arena was now in an uproar. It fairly quaked with the struggles of the combatants. All of my animals except three tigers—Rajah, Empress and Rosie—joined the awful free-for-all. This meant that twenty lions were fighting nine tigers; and

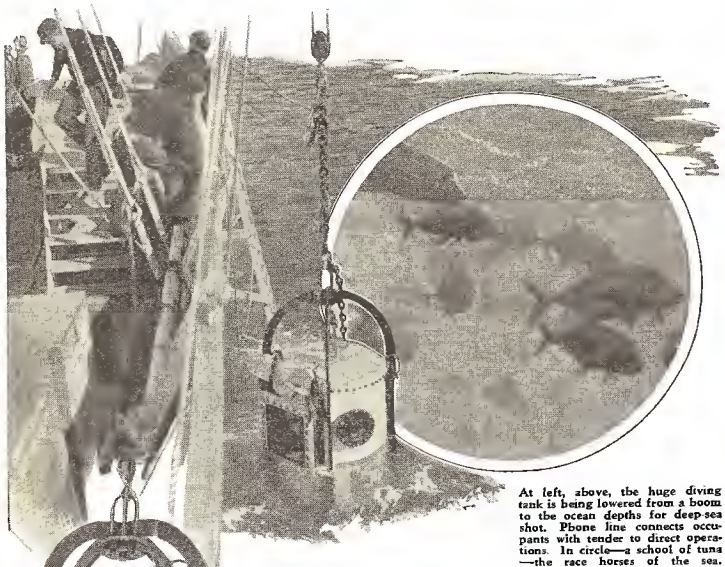


Beatty is here seen teaching one of his especially bright pupils to "walk the ball." The wooden globe is covered with a thick matting which permits the tiger to get a firm grip, and rolls between two rails, as shown, to prevent side-slipping.

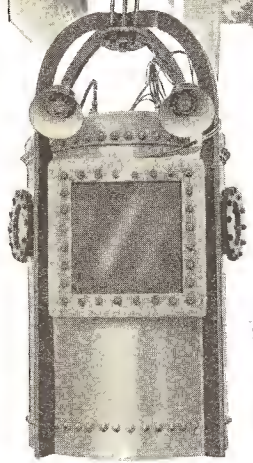
* Published by Century Co.

Strange PERILS of Making MOVIES Beneath the Sea

Hollywood's most intrepid cameraman relates startling adventures he has encountered making undersea movies which chill your blood.



At left, above, the huge diving tank is being lowered from a boom to the ocean depths for deep-sea shot. Phone line connects occupants with tender to direct operations. In circle—a school of tuna—the race horses of the sea.



Through the plate glass windows of this huge diving bell Mr. Scott has filmed many of his thrilling deep-sea dramas. With heavy lead flooring, it descends to 180 feet below the surface.

by HOMER SCOTT

Pioneer Underwater Cameraman

IN 14 years I probably have gazed into the cold eyes of more curious fish and looked on the bodies of more actors and actresses beneath the sea than any other man.

From the shores of Southern California to the rocky coast of the Socorro islands, far south in the Pacific, and even off the shores of New Zealand I have descended many times in one of my half-bells, my legs dangling puppet-like in the cold water, to photograph dramas that sometimes thrilled me more than were the audiences that viewed the results on the screen.

When the editors of MODERN MECHANIX AND INVENTIONS asked me to write of the thrills and tell you how these scenes are filmed, I said to myself, "Gosh, there's nothing very interesting about undersea picture-taking."

But as I sit pondering the problem, it occurs to me that possibly I have had a privilege denied to all but a few men—to see human life mingling with the unknown beneath the ocean, to study native life beneath the sea, to experience death close at hand, only to escape with seconds to spare.

How many times I have been plunged into the Pacific from the yard arm of some rocking ship I can't even guess. But I remember one episode with a strange vividness. We had gone one fine day to the waters off Catalina Island to record the finding of a prop treasure chest 50 feet below the surface. Above me, as I was being lowered away, stretched a nearly-new steel cable which had been recently tested to a breaking strength of 30 tons. Down I went . . . ten feet . . . twenty . . . thirty. Then suddenly I shot downward. The cable had parted.

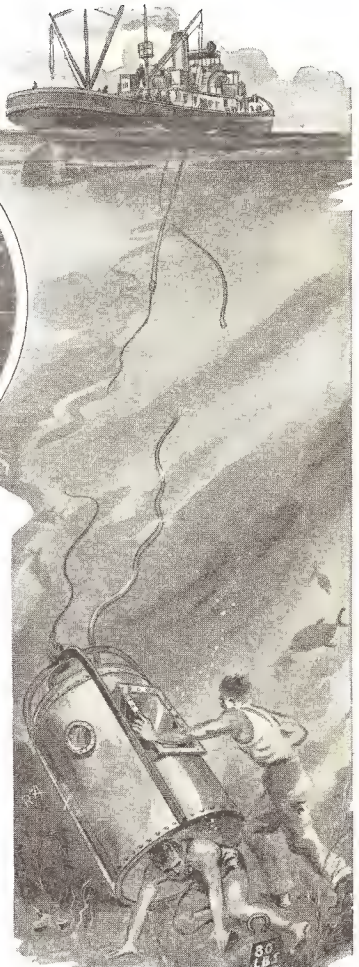
Movie men on mother ship rescuing Scott, unconscious, after he came near drowning as diving bell cable parted.

I kept my legs drawn under me as I neared the floor of the ocean, drawing great gulps of air into my lungs for the long ascent to the surface, if, indeed, I could get clear of the bell. I knew I had only a few seconds, for the air line had parted and water was pouring in through the hose.

Those on deck knew what had happened instantly when the weight was released so suddenly. Without pausing to consider his personal danger, I learned later, Fred, a prominent assistant director whom I worked with, grabbed one of the 80-pound weights and leaped overboard. The lead bore him down like a millstone, and within five seconds after I had struck bottom, I saw his form looming up through the window.

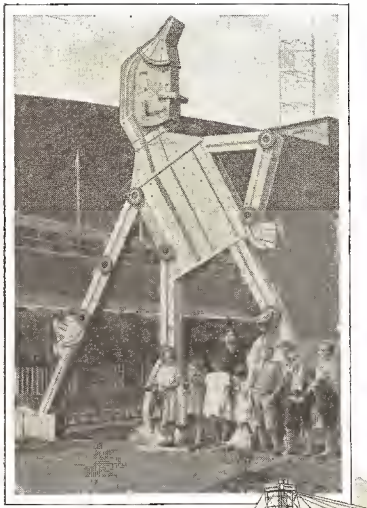
Quicker than you take to read this sentence, he upturned the bell. This enabled me to slide out, and, with our lungs nearly bursting, we cracked through the surface a few seconds later where eager hands pulled us aboard the tender.

Recently in filming "Beneath the Sea" I had occasion to work with one of the largest photographic diving bells ever con-



One of Scott's most thrilling adventures. When cable parted, movie man on tender seized weight, dived to bottom and overturned the diving bell in which Scott was imprisoned by cable break. With lungs nearly bursting, the cameraman swam to surface and safety.

MECHANICAL Wonders of Chicago WORLD'S Fair



The Tin Woodman on Enchanted Island stands fifteen feet high, and is one of the mechanical manifestations of the realm of childish fancy brought to life at the Century of Progress Exposition. Every delight known to kidland is in this Fairyland.

"CENTURY of Progress" is the name given the 1933 Chicago World's Fair, and the whole show is well named, for it is an exposition depicting the progress of man's advance in civilization in the last 100 years. And this progress revolves almost entirely around the advances made in science and mechanics in that length of time.

Every conceivable mechanical oddity worth displaying is on show, and each month during the course of the exposition MODERN MECHANIX AND INVENTIONS will display for readers who are unable to view the fair an increasingly augmented series of unusual pictures to help carry the true import of the exposition.

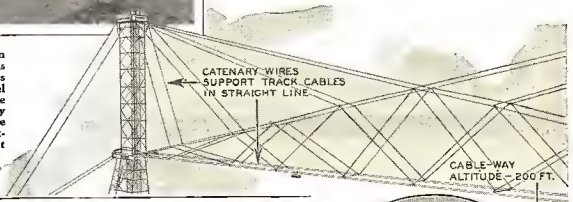
Among the most interesting entertainment novelties is an "Airplane Ride" which is shown in the illustration to the right. A series of loose roller coaster cars, with stub wings, is sent down a dizzy spiral half-tube, so constructed that the train of cars cannot roll out.

Eclipsing even the famous Ferris Wheel of the 1893 World's Fair is the modern "Sky Ride," which bristles with engineering novelties.

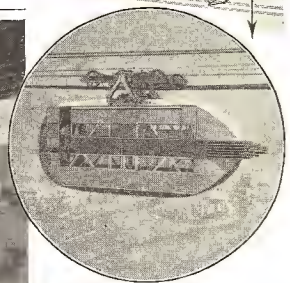
In thoroughly safe cable cars, one may ride a third of a mile through the air 200 feet above ground. The cables suspending the cars are kept in a straight line by a system of catenary suspension wires which take the usual parabolic curve out of the suspended cable-way.

This cable-way is supported from towers which are 100 feet higher than the Washington Monument, and are nearly as tall as the Woodworth building. An observation tower atop each allows an observer to see three states at once—Indiana, Illinois and Wisconsin.

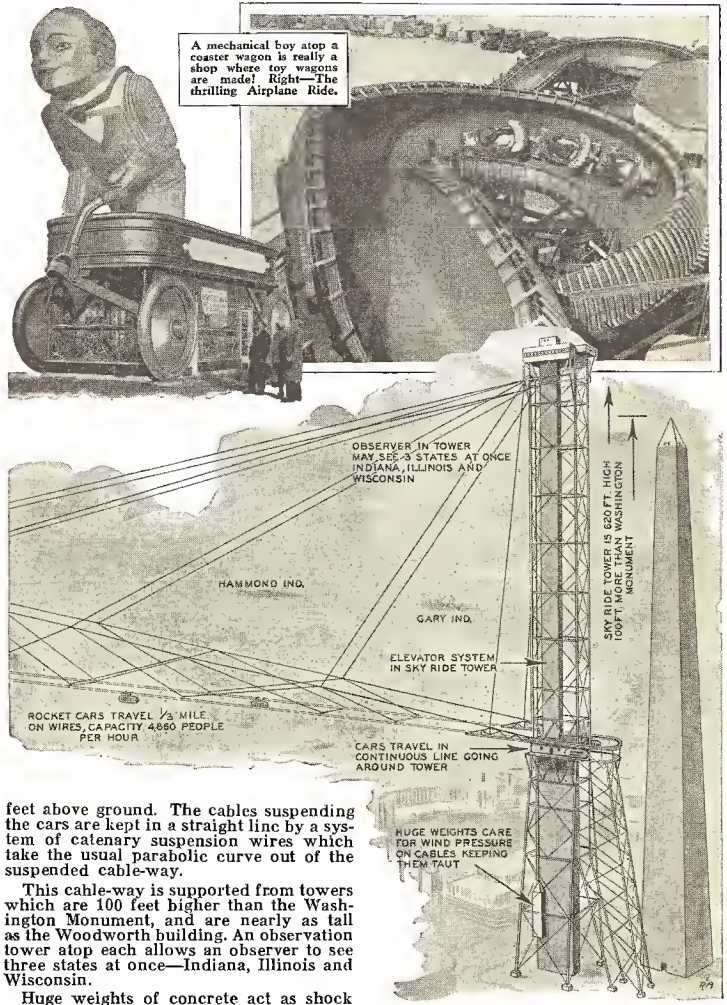
Huge weights of concrete act as shock absorbers for the cables, and take up shocks that are caused by sudden gusts of wind.



Proving even greater an attraction than the Ferris Wheel as a thriller is the 1933 Sky Ride, which gives you this beautiful view of the whole show.



A novel engineering principle is made use of in the thrilling Sky Ride in keeping the suspended cables in a flat line. Normally suspended cables follow a parabolic curve, but by the use of catenary cables the load is so disposed that the cables on which Sky Ride car, shown above as snapped from another car, form level tracks.

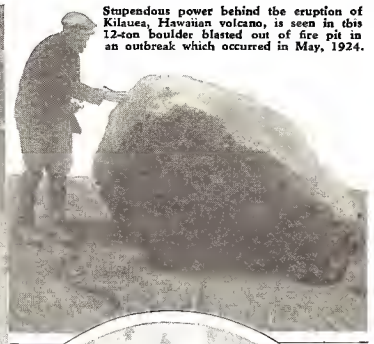

A mechanical boy atop a coaster wagon is really a shop where toy wagons are made! Right—The thrilling Airplane Ride.
OBSERVER IN TOWER MAY SEE 3 STATES AT ONCE INDIANA, ILLINOIS AND WISCONSIN
SKY RIDE TOWER IS 620 FT. HIGH (100 FT. MORE THAN WASHINGTON MONUMENT
HAMMOND IND.
GARY IND.
ELEVATOR SYSTEM IN SKY RIDE TOWER
ROCKET CARS TRAVEL 1/3 MILE ON WIRES, CAPACITY 4,860 PEOPLE PER HOUR
CARS TRAVEL IN CONTINUOUS LINE GOING AROUND TOWER
HUGE WEIGHTS CARE FOR WIND PRESSURE ON CABLES KEEPING THEM TAUT

Daring engineering features of the Sky Ride include use of two towers 100 ft. higher than Washington monument.

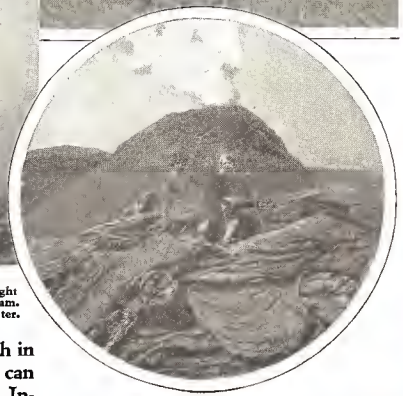
When MOTHER EARTH Blows Off STEAM

by CALVIN FRAZER

Smeroe, one of Java's most dangerous volcanoes, caught by cameraman as it spouted massive cloud of steam. Note boulders in foreground ejected from crater.



Stupendous power behind the eruption of Kilauea, Hawaiian volcano, is seen in this 12-ton boulder blasted out of fire pit in an outbreak which occurred in May, 1924.



In the outer crater of Vesuvius is seen these fantastic formations—huge folds of lava once belched forth from the interior of the earth through the constantly smoking interior crater seen in the background of this remarkable photo.

When old Mother Earth bursts forth in fiery wrath there's little puny man can do about it except run for safety. Ingenious scientific instruments, however, can predict these volcanic outbreaks and thus warn when it's time to start running, as told in this authoritative article.

SINCE the year 1500, when fairly trustworthy records begin, 98 eruptions of 57 volcanoes are known to have destroyed the lives of 190,000 people. The enormous property losses involved in these outbreaks have never been estimated.

Quite apart from the scientific interest attaching to the study of volcanoes, the figures just quoted show that these features of the earth's surface call for thorough investigation for the practical purpose of mitigating their terrors.

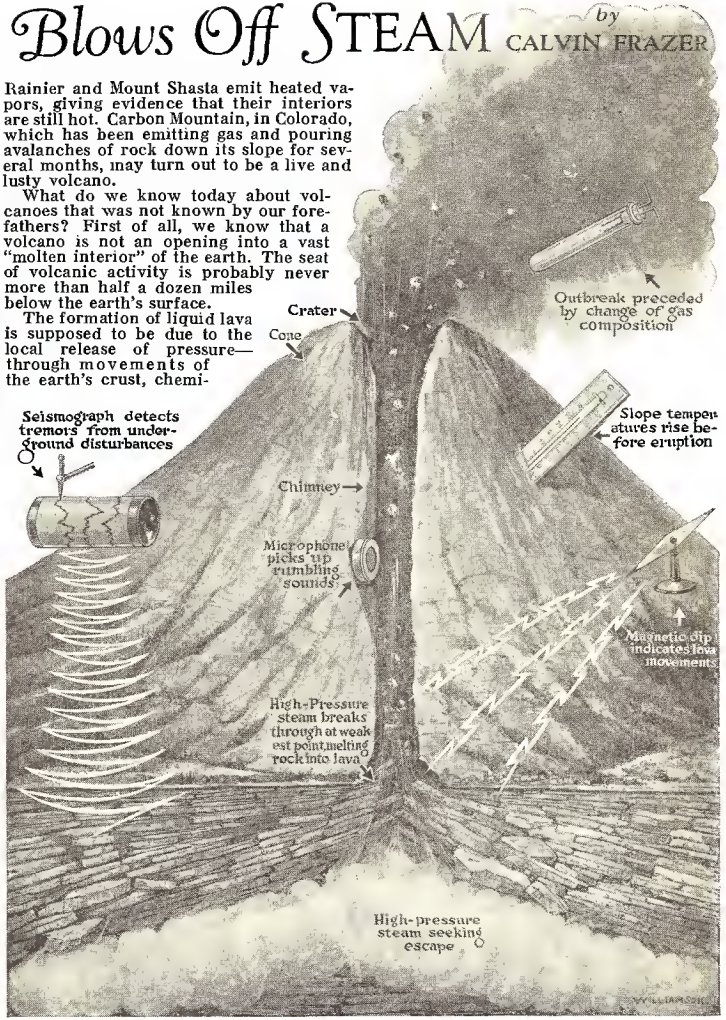
The scientific knowledge already acquired concerning them justifies strong hopes that science will eventually be able to predict volcanic outbreaks long enough in advance to make them harmless to the lives of men.

The average American probably thinks of volcanic dangers as remote from his personal affairs. It is true that within the United States proper there is only one nominally active volcano, Lassen Peak in California, which has been quiet since 1918.

However, great volcanic outbreaks are a possibility to be reckoned with in the United States. Several supposedly extinct volcanoes in this country may come to life in the future. Mount Baker and Mount St. Helens, in Washington state, were in eruption in the middle of the last century. Mount Rainier and Mount Shasta emit heated vapors, giving evidence that their interiors are still hot. Carbon Mountain, in Colorado, which has been emitting gas and pouring avalanches of rock down its slope for several months, may turn out to be a live and lusty volcano.

What do we know today about volcanoes that was not known by our forefathers? First of all, we know that a volcano is not an opening into a vast "molten interior" of the earth. The seat of volcanic activity is probably never more than half a dozen miles below the earth's surface.

The formation of liquid lava is supposed to be due to the local release of pressure—through movements of the earth's crust, chemi-


Crater
Cone
Outbreak preceded by change of gas composition
Seismograph detects tremors from underground disturbances
Slope temperatures rise before eruption
Chimney
Microphone picks up rumbling sounds
Magnetic dip indicates lava movements
High-Pressure steam breaks through at weakest point melting rock into lava
High-pressure steam seeking escape

Cross-section view of active volcano shows seat of eruptive power. Steam generated by stupendous weight of earth pressing down on underground waters, escapes through the weakest point it can find in the earth's surface. Five methods whereby eruptions can be accurately forecast by scientists at volcanological stations are illustrated. Seismograph indicates severe tremblings; microphone hears rumblings of grinding and boiling lava; analysis of gas shows a distinct change in composition; magnetic instruments flutter and gyrate in response to lava movements; temperature of slope rises abnormally high. Science cannot prevent volcanic upheavals but it can predict and thus warn inhabitants of towns nearby in time for them to flee to safety.

1000 Ways to Make a Living

Here again this month Modern Mechanix and Inventions sets forth a group of money-making ideas that have proved their practicability at the task of bringing in a depression income. Look the list over carefully—one particular item may suit your needs and conditions to a T.

Hot-Buttered-Corn-on-the-Cob-5c!

A young fellow, a real go-getter, attracted considerable attention (and coins) at a popular summer resort on the New Jersey coast. He had a portion of a boardwalk store for his place of business and was doing a better business than the store from which he had rented his small space. He ran a Hot-Buttered-Corn-on-the-Cob counter. He bought the corn from a farmer at a much lower price than he would have to pay at a retail grocery and sold it at 5c per cob. Over his stand he had a large attractive sign in red letters which read:

HOT BUTTERED CORN ON THE COB 5c

and people were buying the corn from him as fast as he could hand it out! The delicious aroma of the corn hung over the entire boardwalk and did all the selling job necessary!

Bees Net Good Income

A jobless Colorado man has made a good income during the depression by working with bees. Establishing an apiary near the city limits he sells bees, frames of brood, and queens, and teaches people, who want to help defray living expenses by having their own honey supply, how to care for bees. He cleverly places hives of bees on city premises, in garages, houses, and yards, where they will not be objectionable to neighbors. He drives through the rural district buying and selling bees, honey, wax and apiary equipment. During the dull season he helps other apiarists prepare bee supplies.

Delivery Service for Merchants

Realization that many grocery stores and meat markets had been forced to discontinue their individual delivery services enabled one enterprising man to acquire full time employment at good wages. He observed that these stores in effecting the economy of no delivery overhead had lost the trade of many people. Approaching the proprietors of a number of these stores he made them a proposition to deliver their orders twice a day at no cost to them, the small delivery charge of ten cents being paid direct by the customers who desired the special service. It did not require much persuasion to line up a goodly number of merchants. Large display cards were furnished the stores explaining the delivery service.

Ironboard Cover Holders

One man earns a good living making and selling holders for ironing board covers. He found that housewives were greatly appreciative of a device or gadget that would enable them to quickly change ironing board covers, or replace a scorched one. These holders he has found to be easy to make and they sell readily. Short lengths of No. 8 copper wire have their ends cut slanting to form sharp points; the wires are then bent into V-shapes and the sharpened ends curved to form claws. A short length of light coil spring, attached between the two claws, completes one holder. A set of five holders sells for twenty-five cents and costs about three cents to make.

Ocean Floor Sight-seeing

A youngster in Florida who built a diving helmet from plans given in June MODERN MECHANIX AND INVENTIONS is earning a neat little income by conducting an underwater sightseeing agency on the end of a pier near a swimming beach. A sign stuck up on a post by his concession draws dozens of customers curious to see what the bottom of the ocean looks like. While the sightseer traipses around under the water, the concessionnaire mans the pump on the pier and looks after his customer's comfort and safety. 10 cents is charged for a 15 minute descent.

Shopping News for Merchants

An elderly Buffalo business man who had lost his position struck upon this idea of making his living while reading the advertisements in a local newspaper. He decided to publish a weekly shopping news featuring all the large department stores of the city and advertise their sales for Friday and Saturday. He then solicited ads from these large stores at a great reduction from the advertising rate of the daily papers. The shopping news is published each Thursday and is distributed free to every family in the city. After the appearance of the first edition of his publication he was unable to take care of all the merchants who wanted ads placed in the new medium. This man is now making an enormous weekly income and has a whole staff of men working under him.

Hobby Pays Money

An unemployed man in New York has developed a living from his hobby. He had always been fascinated by tinkering with clocks. Shut out of his regular line of employment, he found that in almost every home there is a clock that either would not run, or else ran incorrectly. The average person will take his watch to the jeweler for repairs but it is very seldom that any one is found who relishes tucking a bulky clock under one arm and marching it down the street. Playing on this natural characteristic of people this former grocery store clerk is now making a very profitable living as a traveling clock repair man.

Money Cutting Glass Designs

With a small portable electric motor (1/6 to 1/12 h. p.), a flexible shaft and a glass cutting emery wheel, any workman who is a fair penman and at all artistically inclined, can, with a little practice, cut simple pattern and designs on glass ware. At first it may be necessary to trace the designs on the glass but the most attractive work will be turned out when sufficient proficiency is attained to be able to work free-hand. With such an outfit jars and bottles may easily be converted into attractive cut-glass articles. Also one may buy plain vases wholesale and cut designs on them.

Mimeographing Advertising and Letters

Practically all kinds of businesses have occasion to send out letters advertising some new item or new prices as well as calling customers' attention to old accounts and informing their best patrons about style and price changes. This applies particularly to small concerns who do not have extensive advertising budgets and must make every advertising penny count to the utmost.

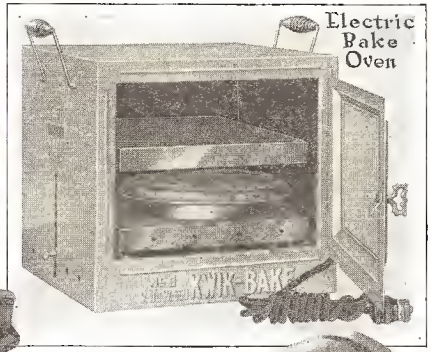
Mimeographs or other duplicating machines may be had on such easy terms these days that a very little amount of work will provide one with the necessary payments on the machine and a margin of profit that grows as work is solicited. Most establishments, especially the smaller ones appreciate a reliable man who contracts to handle this work.

Bug Chasing for a Profit

One man makes a good living by calling on people whose yards have nice attractive shrubbery, and offering to spray the plants periodically to rid them of the insects which are found on most plants. Many species of bug will kill the plants if not exterminated. A good tobacco powder can be bought at hardware stores for 25c per pound and when boiled in two gallons of water will spray several jobs. A good spray gun for hand use can be had at very low prices. After doing several jobs effectively this man has had no trouble in profitably using all his time. The charge is usually figured on a time basis—a $2 job netting about $1.50.

New Inventions for Home Convenience

Motorized Cocktail Mixer



Electric Bake Oven

Motorized cocktail shaker at left makes vigorous shaking unnecessary. Right—Heat of new electric bake oven is applied evenly, elements being built into the shelves.

Handleless Faucet

Water Sterilizing Tablets

These tablets of pure silver in spongy state purify water, killing all dangerous germs.

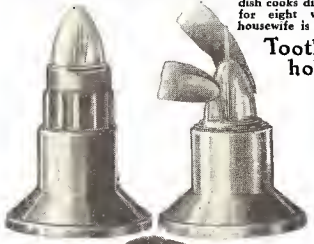
New handleless faucet permits the housewife to fill glass of water while holding tray of food in other hand. In place of the handle there is a stem which projects downward from valve seat and connects with a small rubber tired wheel. Right—Storage space of electric refrigerator is greatly increased by use of wire shelves which attach to the door. Food can easily be replaced or removed by this method.

Refrigerator Door Shelves

Deodorizer

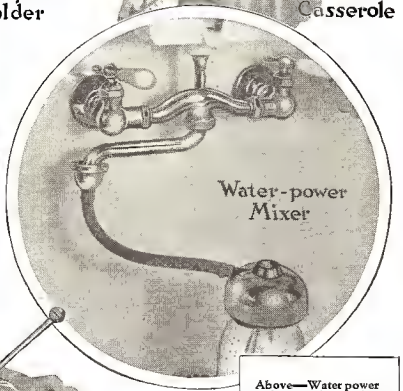
New deodorizer for ice box absorbs all odors, permitting diverse edibles to live in harmony. Right—Casserole dish cooks dinner for eight when housewife is out.

Electric Casserole



Toothpick holder

When slight pressure is applied to cone, this novel holder ejects a single toothpick through a small hole in the top.



Water-power Mixer

Portable Electric Ironer

Above—Water power whipper mixes drink and cools or heats it as you prefer. Water driving the motor discharges over the jar. If you want a cold drink feed cold water into the hose; for hot drink, use hot water. The whipper fits any standard glass jar. Left—Weighing only 30 lbs., this portable ironer can be carried about easily and hung up on the back of door when not in use.

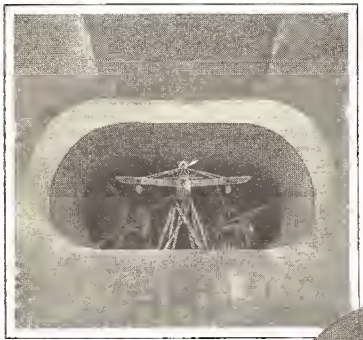
Putting PLANES Through the Third Degree

by Lieut. Corley McDarment

Light Plane Fans, Attend Ye! Here's the inside story of the N.A.C.A. Laboratory by an Air Service lieutenant who knows what he is talking about. Lieut. McDarment lists developments now under way in this ultra modern design laboratory, which is so huge it has a wind tunnel capable of wind-testing full size airplanes!

A NOISE which began like the low rumble of an earthquake gradually swelled in tone until the whole atmosphere over the Langley air field trembled with the vibration.

"What's that unearthly howl?" asked a visitor of an aviator who was guiding him around the big Virginia air base.



A view showing the double 18-foot throat with a full sized flying boat on the dynamometric balance, ready for tests.

"That," replied the aviator, "is an airplane being put through the third degree on the operating table of the giant wind tunnel of the N.A.C.A. They test the strength —or weakness—of planes there."

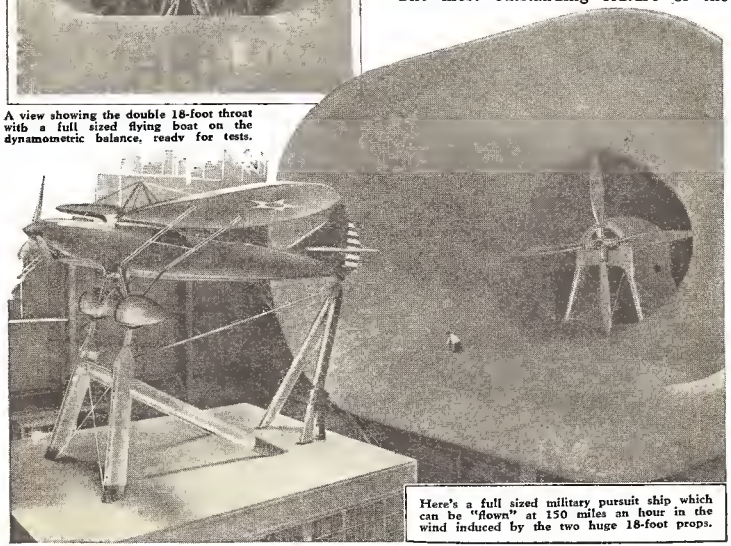
"Are visitors allowed in this—this N.A.C.A.?"

"That's short for National Advisory Committee for Aeronautics," the aviator explained, "and visitors are allowed, but most of the work there is of a confidential or secret nature until finished."

Largest Wind Tunnel in World

And what the aviator said is true. Here in this fairly secluded section of Virginia is the most important aeronautical laboratory in the world and the work is mostly secret or confidential. The "big shots" of aviation compose this aeronautical committee. They live all over the country. But the real engineering research work is done by skilled civilian technicians at the laboratory.

The most outstanding feature of the laboratory buildings is the giant wind tunnel—the largest in the world. Into the huge mouth of this tunnel whole life sized airplanes may be stuffed, and when the four thousand horse power motors begin to spin the eighteen foot propellers, a roar is set up like distant thunder or an approaching earthquake. And an airplane takes a beating.



Here's a full sized military pursuit ship which can be "flown" at 150 miles an hour in the wind induced by the two huge 18-foot props.

Gales Test Strength

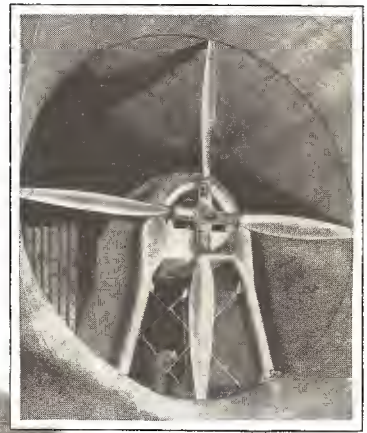
The airplane is securely tied down in front of the maw of the great tunnel while a blast of air with a velocity of 150 miles an hour lashes its wings, elevators and ailerons. Unless the plane is pretty strong pieces will be torn off like a western cyclone strips the feathers from a chicken. A man cannot stand up in such a gale. If he were propped up in it his clothes would be torn off, his eyelids puffed up like little balloons and he might literally drown in air. Aviators of course attain speeds much greater than this, but they are proteeted by goggles and shields.

The object of this wind tunnel and the other interesting test applianees at the laboratory is to get the "low down" in cold mathematical figures of all aeronautical equipment. The Government wants to know the breaking point of metals, the stalling point of certain planes, the flash point of oils and fuel, and a lot of other things that a layman would never think about. Whenever a plane manufacturer declares: "I've built the best plane in the world and I'd like to sell a batch of them to the Government," the officials may reply:

"That's fine, we'll take a sample plane and give it the third degree in the N.A.C.A. wind tunnel and get the figures on it."

And into the tunnel will the new plane go. It will not be merely set up into flying position and gently kissed with a breeze, but will be blasted with full force backwards, sideways, and upside down. If the plane has any "rheumatic" joints they show up.

When a plane is trussed up for the tunnel it goes like a patient to an operating table. Little instruments are stuck all around over it, but instead of testing heart, liver, lungs, grunts and groans as doctors do a human patient, the instruments show the

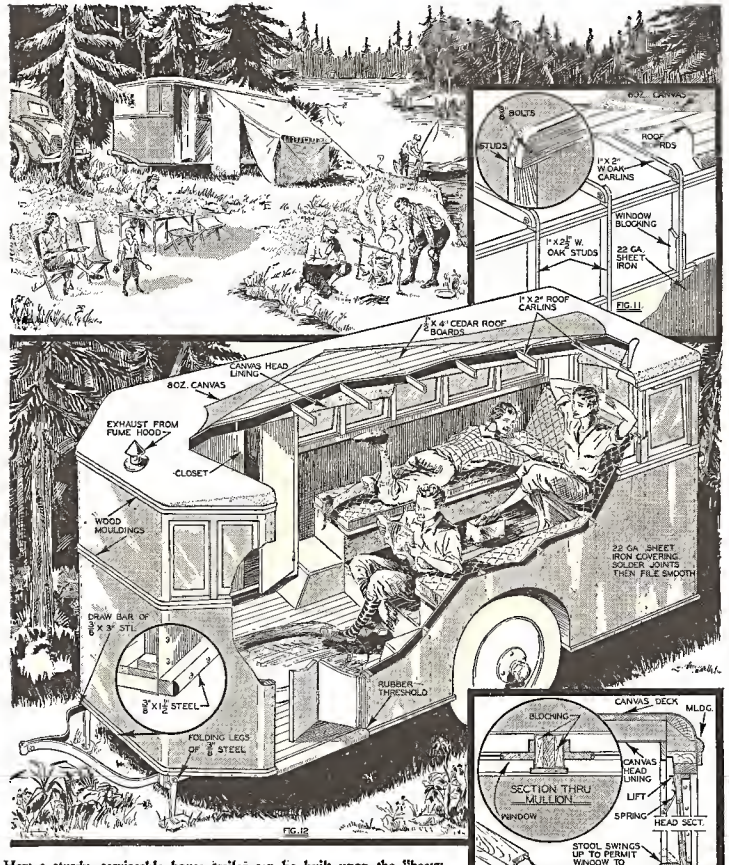


Showing how a man stacks up alongside one of the huge 4 blade 4,000 h.p. props that produce full scale flying speeds.

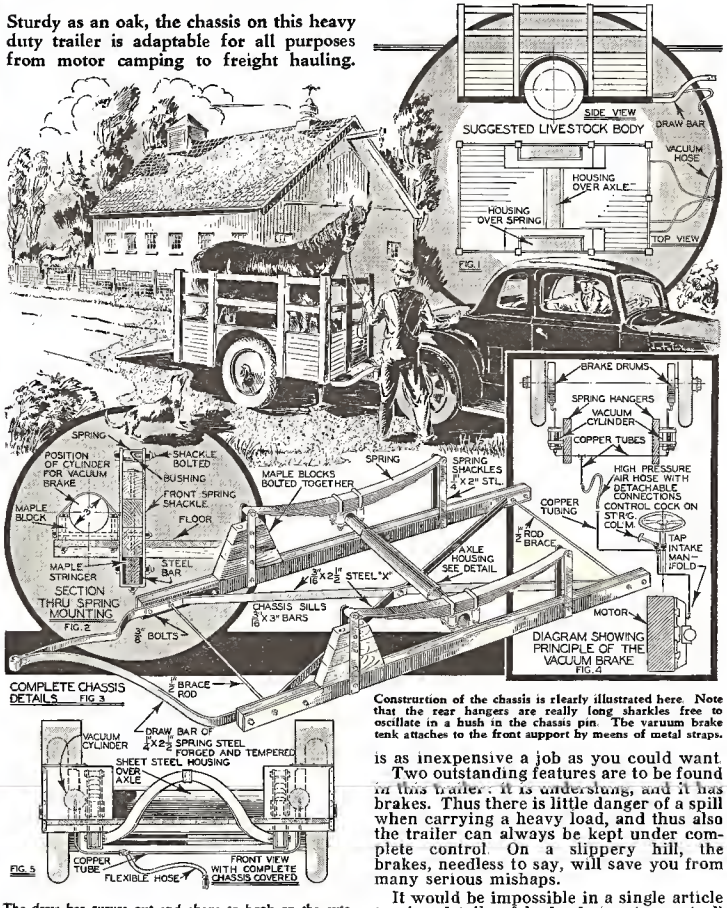
A view of the N. A. C. A. laboratory at Langley Field, Va., from the air. The building housing the full-sized wind tunnel is at the upper right.

"Heavy Duty" Underslung General Purpose TRAILER

Sturdy as an oak, the chassis on this heavy duty trailer is adaptable for all purposes from motor camping to freight hauling.



How a sturdy, serviceable house trailer can be built upon the "heavy duty" chassis is illustrated in these sketches. From details given the builder can adapt the design to his own peculiar conditions. With a lean-to tent attached to each side of the trailer the outfit will "sleep" and "eat" 8 persons comfortably. Note that the axle is back of the center line of the chassis. With this arrangement, the weight of the front of the trailer is partly offset by the weight of the passengers, water tank, and other heavy paraphernalia in the rear. In any case, a weight of 100 to 200 lbs. on the draw-bar is an advantage, as it prevents the rear of the towing car from bouncing. Farmers will find the chassis adaptable for construction of a trailer for hauling stock, farm produce, etc. On the other page is illustrated a design for a stock trailer. In this case it is advisable to lay down a floor of extra heavy planking. Note that the back lets down to form a gangway for the horse. Balance of the trailer subjects the horse to a minimum of jouncing. . . . The underslung trailer is recommended for use in districts where the roads are reasonably good. Of course, in heavy sticky "gumbo" the underslung trailer would be out of luck, because of its limited clearance, but so would any other type of trailer.



The draw bar curves out and above to hook on the auto at height illustrated in this front view drawing.

Construction of the chassis is clearly illustrated here. Note that the rear hangers are really long shackles free to oscillate in a hush in the chassis pin. The vacuum brake tank attaches to the front support by means of metal straps.

DAIRYMEN, truck gardeners, orchardists, motorcampers—anyone with any hauling to do—will find in this trailer chassis just the thing to fill a long-felt need for extra freight space. With auto wrecking yards teeming with axles, springs and wheels which can be bought for a song, it is as inexpensive a job as you could want.

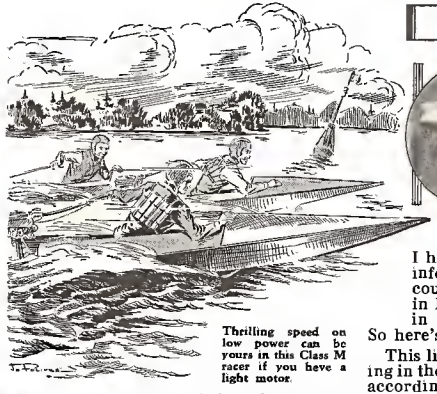
Two outstanding features are to be found in this trailer: it is underslung, and it has brakes. Thus there is little danger of a spill when carrying a heavy load, and thus also the trailer can always be kept under complete control. On a slippery hill, the brakes, needless to say, will save you from many serious mishaps.

It would be impossible in a single article to give details of body design to meet all requirements, so this article centers on the essential chassis construction, leaving the style of body optional with the builder.

Instead of using a discarded front axle assembly as the basic unit, the underslung trailer is built up on a rear axle assembly of the full-floating type. Figure 6 illustrates this type of axle. The full-floating type axle

PLANS for a MIDGET Outboard HYDRO

designed by Edw. Fitzgerald



Thrilling speed on low power can be yours in this Class M racer if you heve a light motor.

Nifty and neat, and up-to-date is this little baby hydroplane of Fitzgerald's.

SIDE VIEW OF THE COMPLETE BOAT

MY SALUTE to the web footed members of the Hangar Gang! This is Eddie Fitzgerald talking, and may I introduce myself again as the chap who made Andy's column some little time ago with a picture of my Midget? Remember the letter where I said I'd answer all inquiries concerning the little go-devil?

That was some time ago, and I wish now I hadn't volunteered to cough up the info, because I have since moved a couple of times from my former home in New York City, and letters persist in dogging me to my new address. So here's the dope for all:

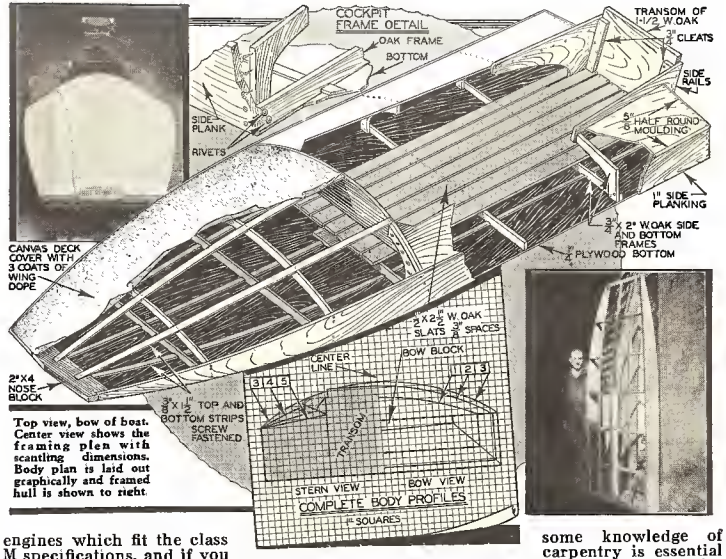
This little cart was built for next to nothing in the way of materials, and constructed according to instructions I'm shooting you in a few minutes. She will do nicely as a racer in the new class "M" or Midget class, and will skedaddle along at about 25 miles an hour with one of the small 2-cylinder opposed 2 h.p. Johnsons, or equivalent. Outboard Motors Corporation of Milwaukee, Wisconsin, or the Johnson Motor Company, of Waukegan, Illinois, or the Caille Motor Co., of Detroit, Michigan, all make engines which fit the class M specifications, and if you will write these firms you can compare the merits and prices of the motors if you do not have one already.

I got up a mimeographed sheet that I sent to a whole slough of fellows who asked me about my little job, and here is the sheet, word for word:

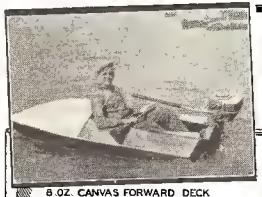
Good tools, plenty of space and at least some knowledge of carpentry is essential to build this little hydro. Tools should include: Hand or breast drill, small plane, ratchet screw driver (unless you like blisters) and, of course, hammer and saw, a good rule; a square will also be very handy.

2 pieces of white pine, 8 ft. x 8 in. For

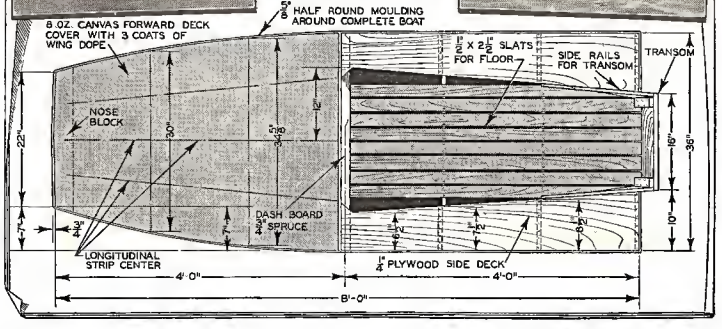
(Continued on page 128)

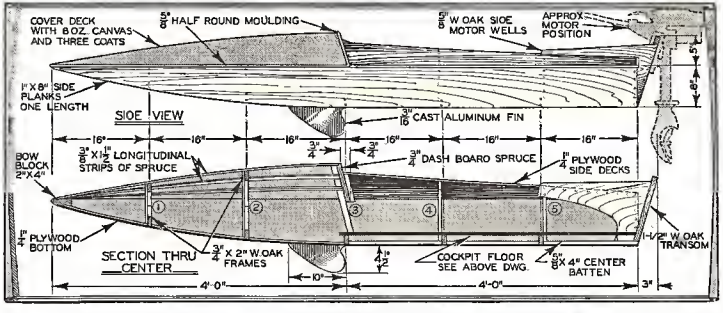


Top view, bow of boat. Center view shows the framing plan with scantling dimensions. Body plan is laid out graphically and framed hull is shown to right.



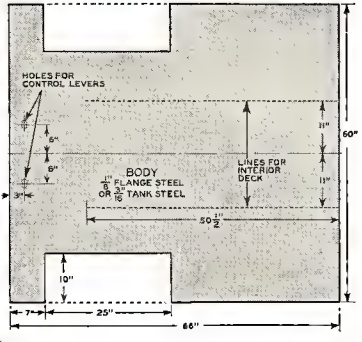
Below is the plan construction view of the Midget. The deck ribs and plywood side decking, and floor slatting are clearly shown. Left, Eddie Fitzgerald pauses for a look-see at a camera, and at right he is shown on the Hudson.

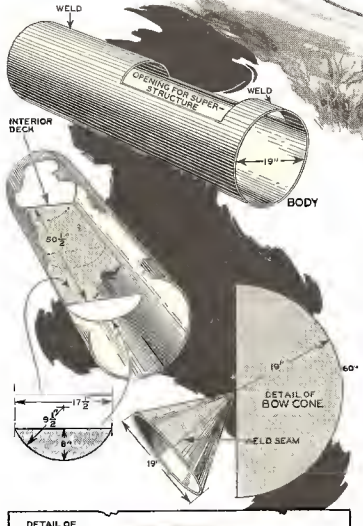


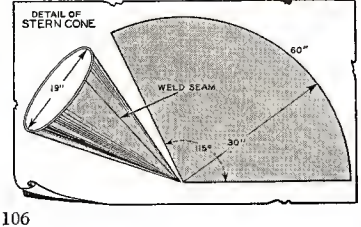

COVER DECK WITH 8 OZ. CANVAS AND THREE COATS
5/8" HALF ROUND MOULDING
5/8" W.OAK SIDE MOTOR WELLS
APPROX. MOTOR POSITION
1" X 8" SIDE PLANKS ONE LENGTH
SIDE VIEW
3/16" CAST ALUMINUM FIN
16" 16" 16" 16" 16" 16"
3/4" X 1" LONGITUDINAL STRIPS OF SPRUCE
3/4" DASH BOARD SPRUCE
1/4" PLYWOOD SIDE DECKS
BOW BLOCK 2" X 4"
1/4" PLYWOOD BOTTOM
SECTION THRU CENTER
3/4" X 2" W.OAK FRAMES
1-1/2" W.OAK TRANSOM
COCKPIT FLOOR SEE ABOVE DWG.
5/8" X 4" CENTER BATTEN
4'-0"
4'-0"

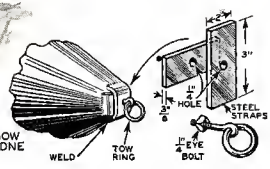
The outboard and inboard construction profiles of Eddie's Midget. You will note there is no step. In such a short boat, unless used for extreme racing, there is little to be gained by the use of a step. Framed thus, boat is easier to build.

Take Thrilling Underwater Cruise in ONE-MAN SUB









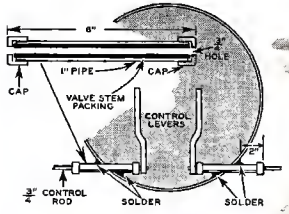
Pushing forward on control levers flips up the diving fins and causes the boat to submerge. For smoothest undersea cruising the tow rope should be at least 100 feet long. Drawings give necessary constructional and assembly deta.

YOU get all the keen thrills of deep-sea diving and underwater cruising in this one-man submarine. Towed by a motor-boat, the novel craft will take you down to a depth of at least 30 feet, where you can explore the river or lake bed. Through a special conning tower you can watch the fish as you dart among them, the while maneuvering about like a real submarine.

Construction of the sub-sea boat calls for the use of either a welding torch or a riveting outfit, the former being preferred, as it makes the craft completely water-tight. Dimensions herewith are for welding. Measurements will have to be increased for overlapping if the members are riveted.

One-eighth inch flange steel or three-sixteenths inch tank steel is used throughout. Complete dimensions for the body are given in the drawing at the top of the page. The sheet should be bent into a cylinder 19 in. in diameter and welded.

For the accommodation of the skipper, and also for internal bracing, an interior deck is constructed. On this the navigator lies, stomach down, and hands on the control lever, as demonstrated in an accompanying drawing. The deck end pieces are welded in place, as is the deck itself.



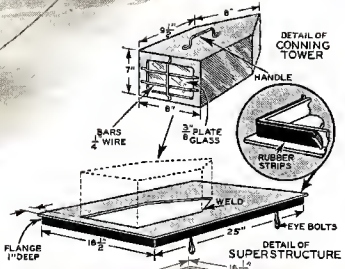
Control rods pass into hull through the 1-in. pipes, which are soldered to the metal as seen above. Skipper inspects underwater scene through plate glass in the conning tower. Eye bolts are secured over hooks to tighten down tower.

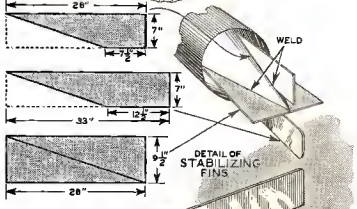
All other necessary dimensions are given in the accompanying drawing. The construction of the conning tower lid, however, calls for comment. Note that the "lid" is equipped with a strip of rubber which renders the sub air-tight when the conning tower is tightened down. Take particular pains here to get a good, water-tight fit.

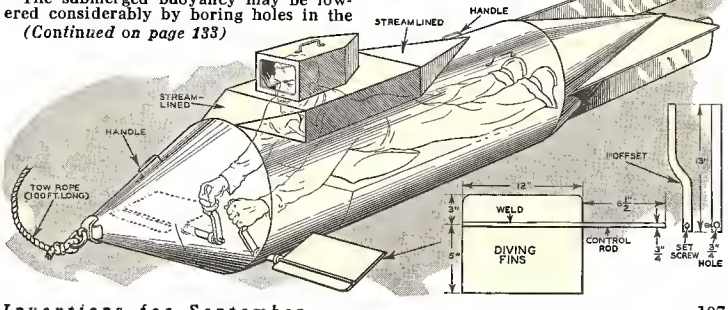
A point that has to be determined separately for each individual case is that of buoyancy. This depends partly on the weight of the materials, and partly on that of the operator. The floating buoyancy may be lowered by boring numerous holes in the bottom of the hull below the interior deck, the effect of these being to give the craft a water ballast.

The submerged buoyancy may be lowered considerably by boring holes in the

(Continued on page 133)

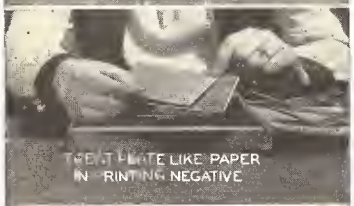


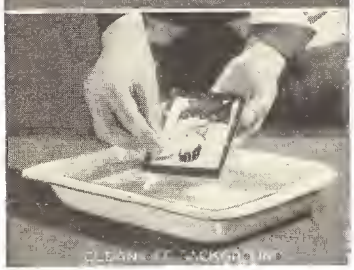




MAKING YOUR OWN Zinc ETCHINGS

by K. B. MURRAY





The sheet zinc plate, after careful burnishing, is coated with sensitized solution. A printing is then made on the metal as with an ordinary photograph. A strong electric light is used for printing; in the case of an arc light an exposure of about eight minutes will be necessary. Daylight can also be used though here the exposure will vary from one to ten minutes. The background is cleaned off by drawing a wad of wet cotton over the surface, after applying a very thin coating of printer's ink.

Chemistry is always fascinating when your experiments bring practical results. This article describes a process used in making the line cuts used in illustrating how-to-build articles in this magazine and shows you just how you can make them yourself for your own printing.

EXPERIMENTERS who enjoy dabbling with chemistry and photography will find the making of zinc etchings—photo line-engravings—a pleasant and lucrative hobby. After some hours spent in mastering the rudiments you can soon learn to make printing plates for your own letterheads and hundreds of other things with the advantage that the designs are strikingly original and different from matter set in type. If you have an aptitude for drawing, your sketches can be easily made into metal from which as many copies as you wish can be printed.

If you are not artistically inclined, follow the method described below and you can make excellent drawings of any subject with the aid of your kodak.

In making the plate shown in the illustrations, a photograph of a girl was used. This was enlarged to 8x10 size.

Line Photograph with India Ink

Place the photograph on a flat surface and commence the drawing by going over the outline with a pen and India ink. You should have a fine pointed and a broad pointed pen at hand; the former for shading in the delicate lines, the other for the more solid lines; and a pointed brush for filling in the completely black portions.

After the figure is outlined, use the broad pen and do the dark portions. Where there are shadows, shade in the portion with fine lines drawn closely together.

When the photograph is completely lined with the India ink, it is allowed to dry well and then immersed in a solution made by dissolving a negative reducing powder in a small quantity of water. The reducer will slowly eat away the silver of the photograph, leaving your drawing on a white background. This should be rinsed well and dried, when any portions you neglected can be touched up with a pen.

Now make a negative of the drawing with your kodak. Give a normal exposure, and in developing the negative use a pinch of potassium bromide to keep the lines clear. It should be somewhat overdeveloped to acquire density. You now have a negative for printing on zinc, and the next step is to prepare the zinc.

A piece of heavy sheet zinc is cut slightly larger than the negative, and one side thoroughly polished with water and pumice powder until it acquires a silver brightness. It is then washed and polished with a dry, clean cloth.

Beat up the white of one egg in a graduate and add to it two ounces of distilled water. In another ounce of the water dissolve ten grains of bichromate of ammonia; this solution is stirred into the egg white solution. Add six drops of strong ammonia water.

This makes a slow-acting sensitizer for the zinc plate. The coating should be done with yellow light for illumination.

Applying the Sensitizer

Flow a small quantity of the sensitizer over the bright side of the zinc plate, allowing it to drain off from one side. A second time the sensitizer is flowed over the plate. Any air bubbles should be broken with the flat side of a toothpick. Drain off the surplus and hold the plate over a source of heat, preferably gas or electricity. Retaining it at an angle so that the surplus solution will flow off, gently blow on the plate. It will dry in a minute. At no time should the plate be heated more than the hand will bear.

Place the negative in a printing frame, and the sensitized zinc plate on top of it. Exposure to a strong electric light, such as an arc light, is necessary for about eight minutes; with daylight, from one to ten minutes.

The exposed zinc is removed to the yellow light and given a very *thin* coat of printer's ink with a roller. Then place it in a tray of water and after a minute draw a wad of wet cotton over the surface. The background should come away, leaving the black inked lines of the drawing on the shining metal. If the entire coat of ink comes away, the exposure has been insufficient; if the background refuses to leave the plate, the exposure has been too long. In either case of wrong exposure, the plate can be repolished with pumice and the exposure repeated after sensitizing.

When you have the exposure right and the background and space between the lines of the drawing are clear, shake off the surplus water and dry the plate by blowing on it over a slight heat.

Proceeding With the Etching

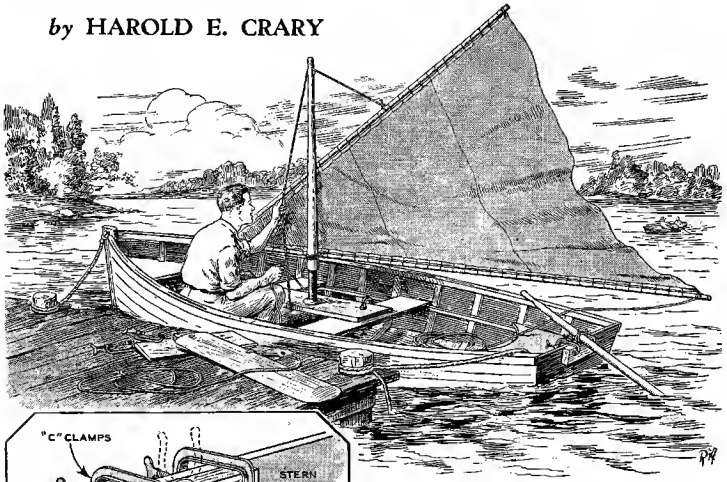
When the plate is dry, it is dusted with a resin powder; ordinary resin can be used, or the resin known as Dragon's Blood, which is a red powder. Brush off the surplus not adhering to the inked lines, and heat the plate until the resin melts and becomes glossy. The back and sides of the plate are then coated with asphalt varnish.

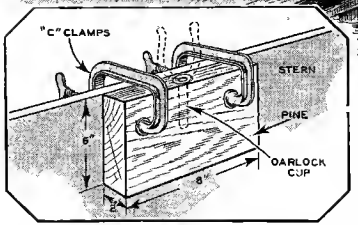
The etching solution consists of thirty parts water and one part strong nitric acid, which is handled carefully. It is placed in an enamel or glass tray; the plate dipped in water, then into the tray, where it should

The printer's ink protects raised or exposed parts of plate. Dragon's Blood (powdered resin) is then dusted on, protecting printing surface from the acid etch. The etching is done in an enamel or glass tray and the work is done by strong nitric acid diluted with 30 parts of water. Extreme care should be used in handling the acid. Too strong a solution will result in undercutting or etching away of the finest lines in the drawing.

This Portable Sail Rig Will Sail Any Rented ROWBOAT

by HAROLD E. CRARY





Small "C" clamps are used to fasten the tiller block to the transom of your rented boat. The steering is done using an oar in an oarlock for a tiller. Old seagoing practice!

This shows how the oar is kept in the oarlock to act as a tiller. Here for once the kind of oar which has a pin through it is worthwhile. The other elements of the outfit are shown disposed in their proper places with the leeboards ready to put on and balance for proper position.

FOR twenty years, since the age of six, I've been building and sailing boats. My first was an eight-foot covered deck job with a wrap-around tarp over the cockpit, and carried only ten feet of canvas. Since then I've sailed everything from a ten-foot Kayak to a forty-foot smack. At twelve I rode out a white squall on the St. Lawrence with eighty-foot of canvas over an eleven-foot canoe. In other words I like boating, and I like your mag because you give us boat fans a break now and then.

I'm very proud of my portable sailing rig, which I made last summer, and used very successfully. I got a big kick out of listening to the wisecracks of the hangerons at the liveries where I hired a rowboat. When I started to unload the tackle from the fliv, they started in wisecracking about "sailors." Their laughter continued until I had clamped the six clamps, and cast off the stern line. But when they saw the boat dart away from the dock, and thread through the traffic, out into the open bay or lake, they didn't laugh any more. If, for any reason, I came back to the wharves before "quitting time" I would receive any number of offers to take on a passenger or two. And the gobs who hired a boat and then spent the rest of the afternoon pulling their arms off rowing around—I've got my opinion of them, when, for ten bucks or twelve at the most, they could build a rig like mine, and sail away.

Three Parts to Rig

So gather 'round you Volga Boatmen, and give a listen. Here's something new in the boating world. A portable sailing rig, which may be attached to any rowboat, even the kind you rent at a boat livery. It's inexpensive, easy to operate, and safe. Best of all, it works.

There are three separate parts to it. The first is the sail tackle. It consists of a triangular sail, two spars, a mast, and a bucketboard. The second is the leeboard arrangement, which takes the place of a centerboard. The leeboard proper is bolted to a block, with a single kingbolt. The block in turn bolts to a sideboard, with four small bolts. Between the block and the leeboard proper is a ball-bearing feature, found on no other leeboard I know of. The third item of your rig will be a steering block. This is merely an eight-inch length of two-inch pine, six inches wide, with an oarlock cup set in one side. Various bits of rope and line complete the tackle.

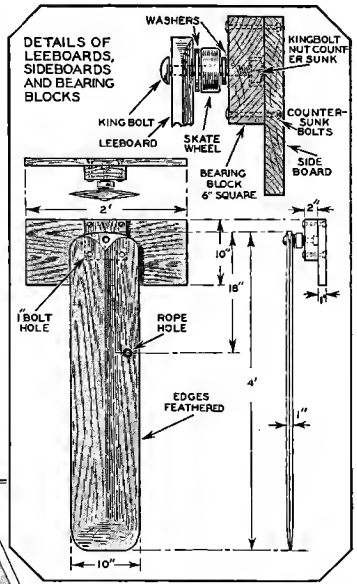
The sail is triangular, as I said. It is twelve feet on the bottom edge, ten feet high, and twelve feet on the "hypotenuse." It is hemmed on the two twelve-foot sides, and a grommet is placed in each of the three corners. The canvas should be doped to prevent mildew. It is cheaper in the long run to have an awning or tent company make up the sail itself, because they do a better job than you can hope to.

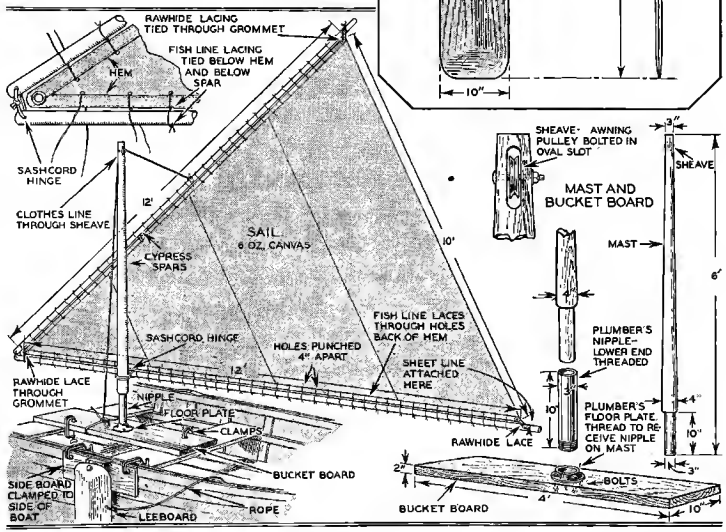
Shaping the Cypress Spars

The spars are cypress, twelve feet six inches long and an inch and a half square. Round the corners and edges with a plane, and then bore a half-inch hole about two inches from the end, on each one. Connect one end of the spars together with a loop of sashcord, so that they are loosely hinged together. The two ends should be about two inches apart when the loop is knotted.

Lay the canvas flat on the ground, and punch holes, just back of the hem on the

(Continued on page 132)





Here are Figs. 1, 2 and 3. They show the dimensions of the sail and show how to lash it to the spars. Also the construction of the "Bucketboard" (having a bucket for the heel of the mast) is clamped on. Leeboard details shown above.

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